MAY 13 1935

ELECTRICAL WORLD

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MAY 11
1935

ARTHUR AND GWENDOLYN MARRY

Utilities should fight for favorable public relations
Dramatic treatment of the problem of human relations
An analysis of utility methods and suggestions for action
Fundamental coaching in the field of elbow-rubbing

•

INSULATORS RESIST RIFLE BULLETS

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Uses Davy "Vibrometer" and "Vibroscope"
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MELTING METALS ELECTRICALLY

Types of furnaces available and their characteristics
Heating load promises to equal industry motor load
Arc furnaces invading the iron foundries
Special alloys and precise specifications favor furnaces

•

VIRGINIA RURAL SURVEY AND PLAN

Serves as guide for spending the $100,000,000
Official data show true possibilities for farms

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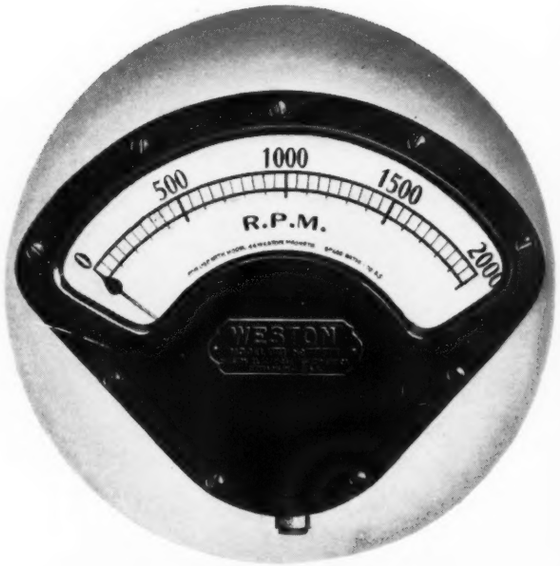

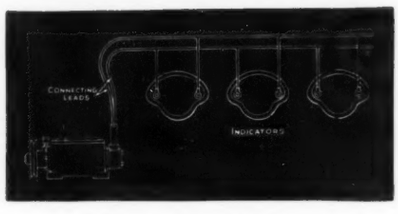

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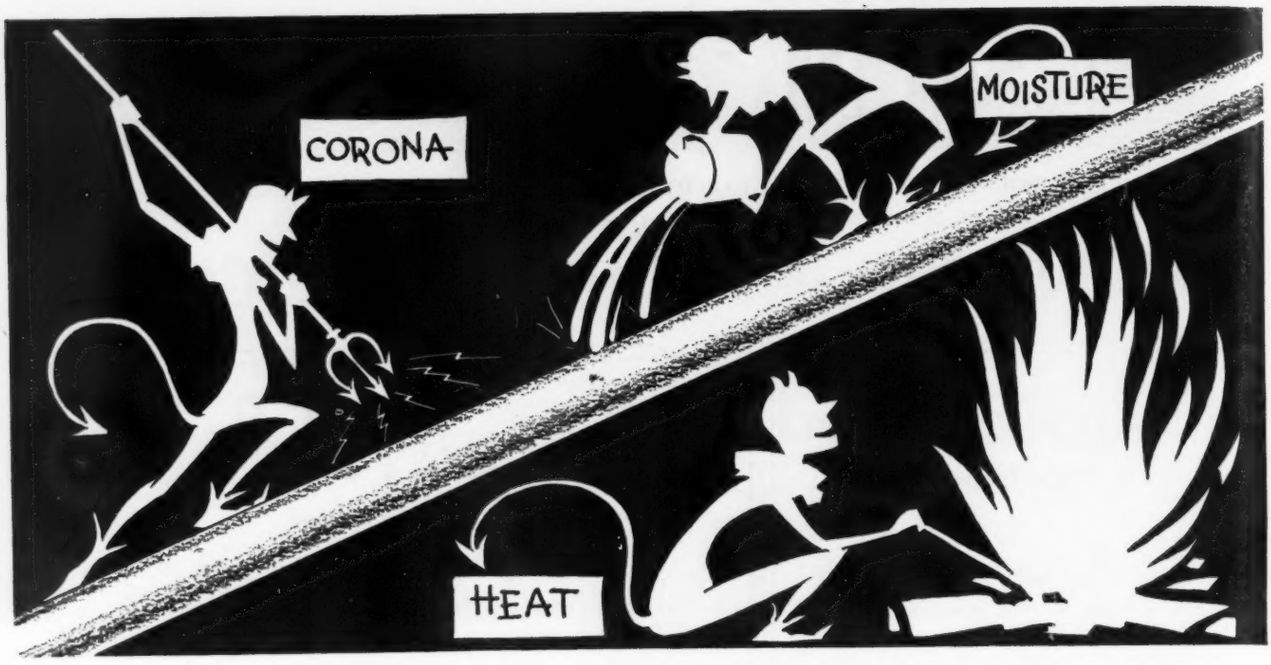

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OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

. . . *Trends* . . .

As Gleaned from this Issue of "Electrical World"

▸▸Stand Up and Fight

According to Edward Connell, all the world loves a fighter and an erring human being. He says the utilities are too meek and too perfect. In fact, he preached quite a sermon on public relations. We don't agree with all his statements, but we like his style and his punch. That's why we pass his ideas on to you.

▸▸Don't Sell for Self-Defense

Plenty of action is now being had in load building. New records are being established for appliance sales and for energy sales. A wave of popularity for home electrification is sweeping the country and the industry is cashing in as a consequence. It should do this enthusiastically. No matter what happens, this is a direct move in the right direction. William Hodge points this out. But self-defense is not the attitude to assume to get sales results. It is necessary to have co-operation and enthusiasm for selling from top to bottom of an organization. It is necessary to put man-power and money back of sales. Those who fill this specification are getting astounding results. We have some stories coming that stand out like beacons to light the way to better times.

▸▸That Heating Market

Estimates indicate that the electric heating load promises to equal the motor load. Progress in getting this load has been slow. But now that steel mills and other metal-working industries are modernizing and picking up business an opportunity is afforded for a new start. George Hall gives a rapid summary of the furnaces available for melting metals. He tells about their characteristics. We need more economic and application data to supplement the information. This must come from installations. However, we think control and quality in themselves are sufficient to sell electric furnaces. There is a new demand for high-quality metals that can be satisfied best by electric melting.

▸▸Shot-Proof Insulators

Hunters and small boys like to shoot at insulators. It's fun for them, but not for the utility men. They have to rush out and fix up the lines as well as answer complaints about outages. What to do about it? Call on the research men, of course. G. M. Whisler tells about tests and developments designed to make bullet-proof porcelain insulators. The shooting season this fall will tell us whether theory and practice agree. We ask a great deal of insulators when we want them to be bullet-proof as well as lightning-proof.

▸▸New Kinks in Generator Balancing

We used to publish articles about valve settings on reciprocating engines. These are now obsolete. But troubles persist in new forms. One is the task of balancing the enormous masses that go to make up modern hydro units after they are installed. J. C. Gaylord gives a new technique to use in the field. It should help many out when repairs or remodeling causes rebalancing to be required. It is the kind of article that helps the other fellow.

E.E.I. Convention

Atlantic City, June 3-6

Two Outstanding Issues:

1. **An exhibit in print—new and improved apparatus brought out in the depression years—May 25.**
2. **Report of the convention—June 6.**

▸▸That $100,000,000 Rural Extension Job

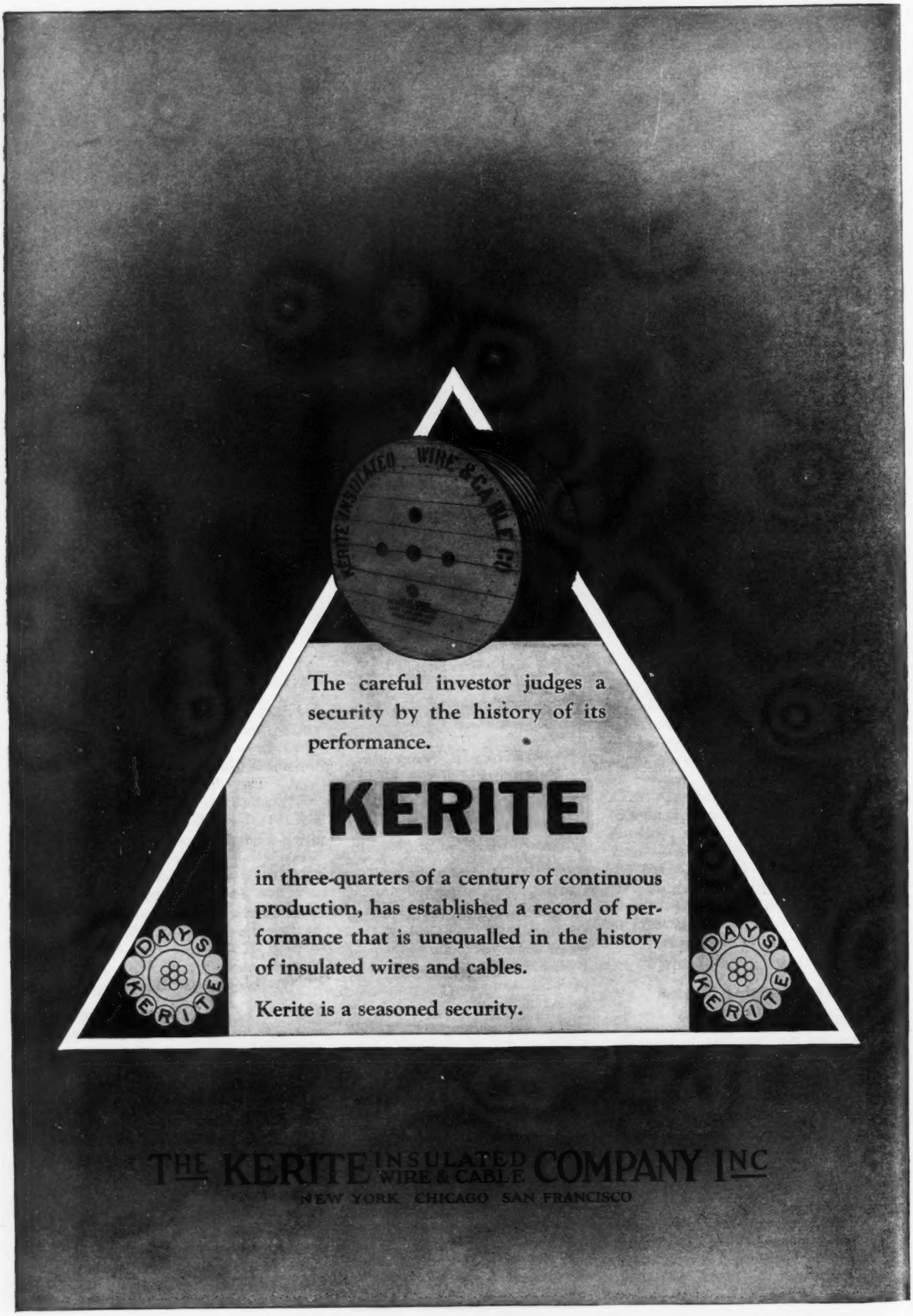
Will the new rural line appropriation be spent intelligently or politically? Nobody knows. The survey made in Virginia shows the intelligent approach to the job. But we have read some startling messages to farmers and have seen some staggering data. They are told to go directly to the government if they want electricity. Cost data are given on a minimum basis such as wiring for $40 and up, ranges $60 and up. The "up" is very significant. No matter how the job is done, the $100,000,000 will be spent. This should mean business for electrical manufacturers and electrical utilities.

▸▸Output and Intake

February sales of electrical energy outran those for the month in every other year except one, but revenue is trotting along on shorter legs. The domestic consumer's bill remains virtually unchanged, his ever-increasing consumption just about balanced by ever-decreasing rates. Wholesale use has been more than restored to the level of four years ago and the movement is upward, rather than downward as it was in 1931.

▸▸New Electronic Bombs

There is no defense against new developments in the art. They explode like bombs to destroy existing equipment and practice. An army of electronic devices is now invading the power realm. Philip Sporn talks about the victories they have gained on American Gas & Electric properties. He gives enough evidence to make utility engineers and electrical manufacturers sit up and take notice. It looks as though all of us must get acquainted with those things called electrons that were unknown fifteen years ago, but are now invading the power field.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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

PUBLISHED EVERY OTHER SATURDAY

MAY 11, 1935

Utilities by the Fireside

IN HIS recent radio talk President Roosevelt put utility legislation in the "must" category. His earlier message to Congress was a direct and vigorous advocacy of the Wheeler-Rayburn bill. His later radio statements were less insistent and less definite, but even so were interpreted as again supporting this bill.

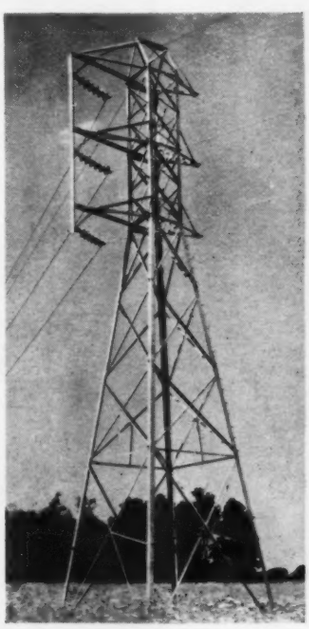
He said he wished to eliminate "unnecessary" holding companies. That this was essential to recovery. He said the elimination of these holding companies would destroy no values. He intimated strongly that he believed in decentralized private ownership and operation of utilities. He decried any concentration in management or finance. It was a negative statement.

In the light of the testimony presented at the hearings on the Wheeler-Rayburn bill and of the actual provisions of this bill we cannot reconcile his statements with the facts or construe them as a definite argument for the passage of this bill.

The Wheeler-Rayburn bill is more than a holding company bill. It is destructive to operating as well as to holding companies. It destroys state regulation. It puts nearly all utilities, operating as well as holding, under federal bureaus. It contains many punitive and unworkable provisions. These facts were shown at the hearings.

We cannot believe the President would support this bill if he would read the testimony or study its provisions in detail. It does so much more than eliminate holding companies. It attempts to destroy the entire utility industry and to replace private enterprise with bureaucracy. No fairminded person can support this bill in its present form.

It is shocking to hear the President say that the elimination of holding companies is necessary to bring about recovery. It is astonishing to hear him condemn the concentration of power in the hands of private individuals and then advocate this concentration in politically appointed federal bureaus.



Evidence presented at the Wheeler-Rayburn bill hearings showed conclusively that its passage would destroy utility values. The very threat of this legislation has already destroyed values. It would bring chaos in financial markets and losses to millions of investors through the mechanism used to carry out its provisions.

We take issue with the President in placing this utility legislation in the "must" class of recovery measures. On the contrary, it is the one thing that is holding back recovery. It prevents the electrical industry from going into action to sell and to put people to work.

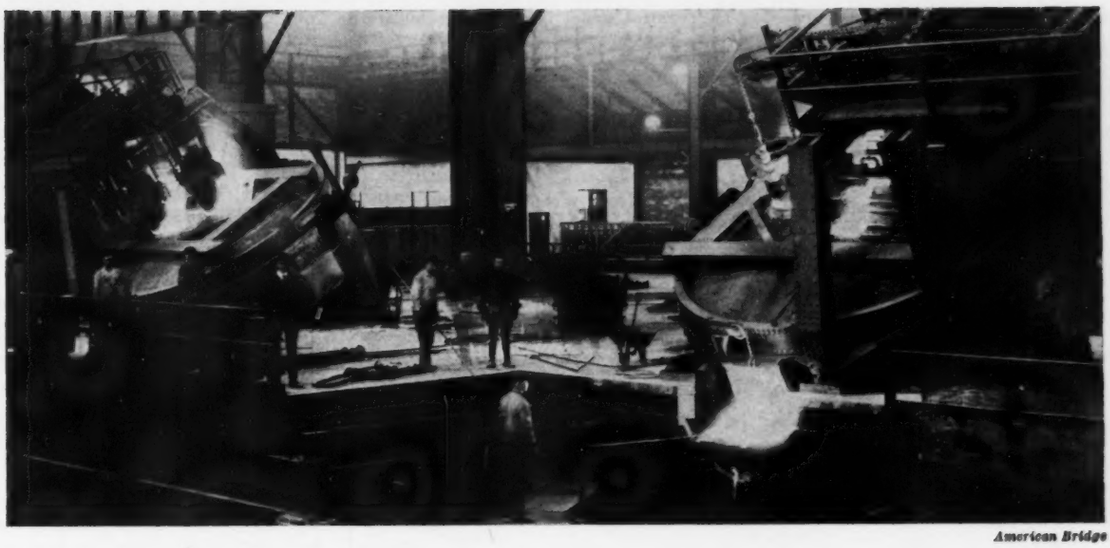
NO MORE utility legislation is needed. The state commissions and S.E.C. will prevent financial abuses. State regulation has been strengthened to prevent other bad practices. The utilities have cleaned house and adopted all good policies recommended to improve their organizations and operations. They have lowered rates. They would like to go to work.

Encouragement, not destructive legislation, is what they should have at this time. It is far-fetched indeed to call theoretical reform legislation necessary recovery legislation. It is against the public interest to attack this industry unceasingly and unnecessarily because of some bad practices in past years, because of some theoretical conceptions about big business, because of political expediency.

We hope the Wheeler-Rayburn bill will be rewritten promptly. This action would bring progress in recovery under the auspices of the electrical industry that would astonish the nation with its magnitude. Utility baiting in high places has no place in a national recovery program.

NOCTURNAL CHARM

Beauties of Nature usually defy enhancement by man. But after nightfall they can be revealed in new glory quite different from their daytime appearance by skillful application of floodlamps. Natural highlights and shadows can be changed, artistic silhouettes produced, ordinarily concealed beauty spots emphasized and cascades converted to colorful activity. Just a few examples of the possibilities are shown by these scenic spots near the city of Katoomba, New South Wales, Australia, where the municipality has installed 28 projectors with beam candle powers ranging from 10,650 to 137,000.



American Bridge

Direct-arc furnace built in 40-ton ratings

Melting Metals Electrically

Direct-Arc, Indirect-Arc, Induction and Resistor Types—All Have Appropriate Applications

By **GEORGE H. HALL**
Consulting Engineer, New York

In twenty years electrical melting of metals has attained real production magnitude. It is taking the place of fuels used from time immemorial following the Stone Age. At first it was only a melting task and that still constitutes the major assignment. The age ahead calls for superior metals and superlative alloys. One or another of these forms of electrical preparation will be used to make them. The characteristics and peculiar advantages are cited here as a contribution to the next cycle of activity.

AT PRESENT there are four basic types of electric melting furnaces in general use, the classification being based upon the method by which electricity is employed to raise the temperature of the metal to, or above, the melting point. These are: (a) Direct-arc furnaces; (b) indirect-arc furnaces; (c) induction furnaces; (d) resistor furnaces.

The direct-arc furnace consists of a cylindrical shell (with a refractory lining) mounted on trunnions or rockers and tilted to draw off the melted metal charge. Three electrodes are provided with an automatic feed to maintain the required space between the tips of the electrodes and the charge, or metal bath. A hand feed is also supplied for lowering and raising the electrodes readily when starting the melt and after it has been completed.

Electrodes may be of carbon or of graphite. In most furnaces using electrodes of 6 in. diameter or smaller they are usually of graphite, while for the larger sizes carbon or graphite may be employed. Furnaces using 4-in. electrodes would usually operate on a charge of from 1,500 to 3,000 lb., while furnaces handling charges of 30 to 40 tons would employ electrodes as large as 24 in. in diameter.

The lining of this type of furnace, when it is to be used for basic operation, is of magnesite brick up to the slag line, with silica brick on the sides above the bath and on the top. For acid operation silica brick is used throughout.

Direct-arc furnaces are used on three-phase alternating current. The primary of the transformer is wound for the high-voltage service with which the plant is supplied and taps are provided so that a secondary of at least four voltages, having a range somewhere between 150 and 90 volts, may be obtained at will.

Control equipment consists of a main oil circuit breaker having inverse-time overload protection, a voltmeter, three ammeters and switches for the control of the low-voltage taps. A watt-hour meter, curve-drawing wattmeter and power-factor indicator are also desirable, so that the complete story of the operation of the furnace throughout the heat may be recorded. There must also be an automatic control for the motor by which the electrodes are raised and lowered.

Direct-arc furnaces are employed mainly for the melting and refining of ferrous metals using for a charge foundry scrap, plate scrap, borings and, to a limited extent, pig iron. In the refinement of cast iron the electric furnace is capable of producing higher grades of iron and more uniform product than can be obtained by cupola melting. A high grade of gray iron, at a reduced cost per ton, is being made by the duplex operation of cupola and electric furnace. After the iron has been melted in the cupola it is run into the furnace, where it is superheated and the analysis adjusted. After the needed amount of steel, ferrosilicon and ferromanganese has been added the bath is brought up to a tapping temperature of about 3,000 deg. F. (1,650 deg. C.) and the heat then run off. As the furnace is emptied a new batch of melted metal from the cupola is run in and the process thus continued throughout the day.

Ability to thus make a grade of alloy iron which shall always conform to given specifications, together with

the improvement in quality, has resulted in castings so produced in the electric furnace being used to an increasing extent for automobile and machine parts that have formerly been made only of steel.

While the average tensile strength of good cast iron is about 25,000 or 30,000 lb. per square inch, special alloy castings are now being produced in the electric furnace running up to 60,000 or 70,000 lb. per square inch, and in some cases even higher.

The direct-arc furnace is also used to a great extent in the production of plain carbon and many alloy steels, such as nickel steel, nickel chrome steel, manganese molybdenum steel, vanadium steel, etc.

Indirect-arc furnace has rocking action

The indirect-arc furnace is built in the form of a closed, horizontal cylinder, which is lined throughout with a high-temperature refractory, and is provided on the sides with charging door and pouring spout. This type of furnace employs but one pair of electrodes, which are mounted axially with the cylinder. The movement of each electrode is controllable from its entering end through the respective heads of the cylinder. The electric arc is struck between the tips of the electrodes and does not come in direct contact with the metal charge or bath.

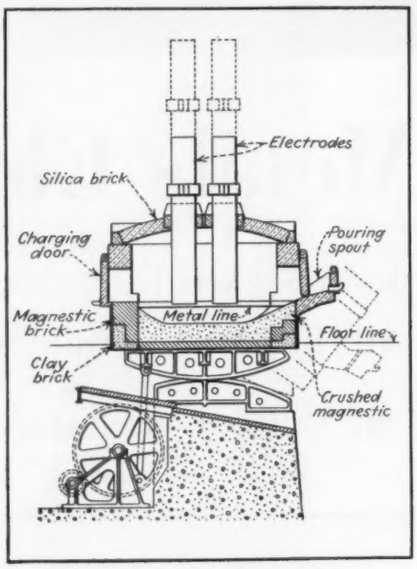
A distinctive mechanical feature of the indirect-arc furnace is found in the method of its mounting and operation. The exterior of the cylinder is provided with two rocking rings, one near each end, which run upon rollers, by which the cylinder is supported. Through these rings, when the furnace is in operation, a motor drive, by means of friction rolls or gears, imparts a reciprocating motion to the entire furnace so that it, with its charge, rolls back and forth, providing a mixing or stirring action to the bath.

For the electrical equipment of the indirect-arc furnace a special design of single-phase transformer is employed, since the use of but one pair of electrodes provides only for a single-phase circuit. The secondary voltage is varied by taps from 90 to 130 volts, depending upon the furnace capacity and the kind of metal to be melted. A reactor, for arc stabilization purposes, with variable taps for changing reactance values, is built into the transformer case. When melting a metal which volatilizes at relatively low temperature, thus introducing excessive metallic vapor into the furnace atmosphere, the arc impedance is low and the arc less stable, so that a relatively lower furnace voltage and higher reactance is necessary than when melting non-volatile metal such as iron.

The control panel contains the main oil circuit breaker, with watt-hour meter and indicating wattmeter, while accurate records of the furnace's performance may be obtained by the addition of curve-drawing meters.

The furnace is rocked through an angle of about 15 deg. and as the melting proceeds this angle is progressively increased until, when the charge is completely melted, the furnace is oscillating through an angle of approximately 200 deg. This full rocking action, occurring at a rate of two cycles per minute, is maintained during the superheating.

Development of the indirect-arc furnace followed by some few years that of the direct-arc and was first used for the production and casting of



Heroult direct-arc furnace tilts for pouring

brass, copper, bronze, aluminum, nickel and their alloys. Its use has now been extended to the production of cast iron of the higher grades, the conditions of melting, mixing and superheating in this type of furnace being such as to provide ready and accurate means of supplying cast iron to meet whatever specifications may be required. It is also used for the production of malleable iron, stainless and many alloy steels.

Induction furnaces higher in voltage and frequency

In its simplest analysis the induction furnace consists of a crucible of refractory material containing the metal charge, while around the crucible is wound a helical, current-conducting coil of copper. The copper coil acts as the primary winding of a transformer and the charge itself forms the secondary. When high frequency current flows through this copper coil, or primary winding, all of the space inside of the coil is subjected to a rapidly alternating electromagnetic field and any electrical conductor, such as the metallic charge, that is placed within this field will have currents induced in it. These induced currents cause a rapid and efficient heating followed by melting of the charge in the crucible.

Water is circulated for cooling purposes through the copper-tube primary winding during the operation of the furnace. The furnace elements are imbedded in heat-insulating material and the whole mounted in a fabricated casing which may take any form best suited to the capacity of the furnace and the purpose for which it is to be used. In the smaller sizes of furnaces the casing is usually rectangular in shape and the molten metal is poured out by tilting the entire furnace, or the crucible itself may be lifted out for pouring. As the sizes increase the entire casings are mounted on trunnions and the crucible provided with a spout to permit easy discharge of its melted contents.

For some classes of work the induction furnace may be made in the lift-coil type in which the bottom rather than the top is open and the casing is lifted into position by a crane and lowered down over the crucible, which sits on a rigid base. A duplex form of drop-coil induction furnace employs a truck carrying two crucibles. One of these is placed in position beneath the furnace, which is lowered and the heating started. While this is in progress the other crucible is being charged so that, as soon as the first heat is completed, the furnace is raised, the truck moved so as to bring the second crucible into position and the furnace again lowered for the next heat. The first crucible is then emptied and recharged while melting is taking place in the second. This duplex arrangement provides for rapid and continuous operation.

Induction furnaces have been commercially operated only on single-phase circuits. For large furnaces a high voltage is desirable to reduce the size of buses and leads, while, on the other hand, the necessity for some exposed conductors renders the use of very high voltages undesirable. Furnaces are in operation in which voltages ranging from 1,800 to 2,000 are employed, but a voltage not exceeding 1,000 seems to be the generally accepted high limit at the present time.

The frequency of the supply line for small furnaces, 20 kw. and below, is usually stepped up to furnace frequency by the use of a mercury-arc converter and operation may be on a frequency as high as 25,000 cycles per second. For the larger industrial installations the frequency, being changed by the use of a motor-generator set, is limited to a much lower figure. The extent to which this frequency shall be raised is governed by the constructional cost of the generator, which for very high frequencies would be prohibitive. Although fur-

naces have been installed for frequencies as high as 2,200 cycles, the balance point between the advantages of high frequency and reasonable generator cost has been found to be about 1,000 cycles per second.

Since the power factor of an induction furnace when operating on high frequency is inherently low the capacity of an alternator to supply the needed current at uncorrected power factor would be excessively high. It is therefore the practice to employ capacitors to supply the large lagging current required.

Charge well mixed by circulation

An important characteristic of operation of the induction furnace is the self-circulation or mixing of the charge. As soon as the metal has become melted the electrodynamic forces in the liquid conductor, the molten charge, together with the forces of gravity, cause a circulation throughout the charge. This action is of great value in hastening chemical reactions in the refining process. Where slag is used for refining this stirring brings the metal in contact with the slag more rapidly than would otherwise result. The stirring is proportional in degree to the power input to the furnace and, as this is readily controllable, it can be hastened or retarded to suit the metallurgical phase of the melting operation.

The principal use of the induction furnace up to the present has been for the melting and refining of steels and alloy steels, especially tool steel and stainless steel. Its use for melting the non-ferrous metals, such as nickel, silver and high copper alloys, has been carried on to some extent, as well as the use of the smaller sizes for melting the precious metals.

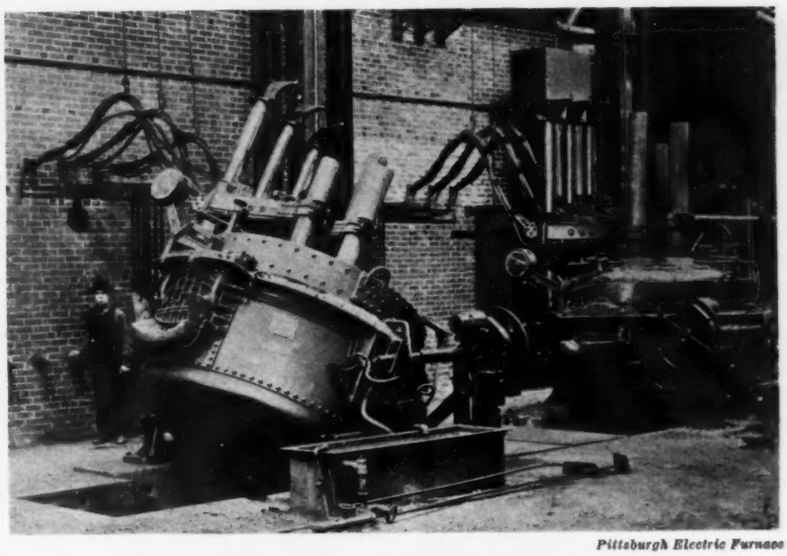
Largest induction melting furnaces in the United States are of 4 tons capacity, although furnaces of 5 tons are used in England and Sweden. Due to convenience and cleanliness of handling and operating this type of furnace a great number of the smaller sizes are in use in industrial laboratories for experimental and research work.

Resistor furnaces for non-ferrous metals

The resistor type furnace consists of a melting pot which is surrounded on the outside by a heating unit or units. These are made of nickel chromium alloy and are sold under various trade names. The melting pot and heating units are inclosed in a structural steel shell, from which they are separated by some type of heat-insulating material. The pot may be closed with a cover, which is removed to allow the melted charge to be ladled out, or, in furnaces of the larger capacities, the pot is provided with a spout and the entire casing mounted on trunnions to afford convenient means of handling and pouring.

Electrical equipment, if in the form of a single coil, operates on single-phase alternating or on direct current, while if there are a number of heating units they may be balanced for poly-phase alternating current when such is available. The operation is usually on 110 or 220 volts. Provision is made for easy adjustment and accurate control of the temperature.

Use of resistor type furnaces for melting is limited to their application to the non-ferrous metals, such as aluminum, white metal, babbitt and tin. Lead, cyanide and salts may also be melted in this type of furnace, but in these cases the melting is incidental to the use of the charge for the heating of steels for tempering and will therefore be discussed in a subsequent article dealing with the subject of electric furnaces for heat treating.



Pittsburgh Electric Furnace

Trunnion type of direct-arc furnace (Moore Lectromelt)

Detroit Electric Furnace

1½-ton rocking furnace raised by rack for pouring

Thyratron Voltage Regulators

Experience Recorded on the Application of Thyratrons to Regulation of Excitation Supplied by Motor-Generator Sets

By **PHILIP SPORN . . . G. G. LANGDON**
American Gas & Electric Company, New York

This is another in the series revealing the progress made in the application of electronic devices to power systems. The two preceding articles (February 2 and February 16) dealt with fractional-ampere or "weak current" devices. In this installment application is extended into the realm of amperes for excitation regulation. A subsequent article will treat magnitudes up to 600 amp. Another will deal with tubes functioning in connection with motors.

EXPERIENCE with heavy current electronic devices on the American Gas & Electric system during the past five years has brought out a number of factors relating to electronic regulators and exciters which are summarized below:

1. Performance characteristics superior to those of electromechanical regulators can be obtained. The two problems of quick response and of obtaining a high ceiling voltage particularly are simplified by the use of tubes.
2. The excessive maintenance required by mechanical contacts operating at high speeds and under heavy duty has been entirely eliminated.
3. General maintenance required by the electronic regulators has been practically nil except for tube replacements and checking.
4. Although tube renewals and tube maintenance were found to be a minor problem in weak current devices, these items have proved to be of major importance in heavy current devices.
5. While metallic gas tubes have in general performed satisfactorily, particularly in the smaller sizes, it is evident that there is room for improvement and that their cost is too high. Further development and more extensive use are expected to overcome both of these present handicaps.

Although mechanical regulators have been brought to a high degree of mechanical perfection, the heavy duty imposed on contacts and other moving parts results inevitably in wear and in frequent mechanical adjustments and other maintenance, and in addition the speed of response of the regulating system is limited by the time lags of both the exciter and the generator (or condenser) fields.

The possibility of taking advantage of the characteristics of grid-controlled gaseous rectifier tubes capable of handling large amounts of current to provide a power regulator having (a) no moving parts or contacts subjected to heavy duty, (b) smooth and accurate control of regulated voltage and (c) speed of response characteristics limited neither by the regulator itself nor by the exciter has received a considerable amount of study and attention during the last ten years. It seemed fundamental that electronic devices could be made to perform such heavy-duty service better than mechanical devices, although actual field experience on these devices and on the tubes to determine the practicability of the application was lacking, particularly at the higher power levels.

It also appeared probable that the operating experience gained with electronic regulator applications at high power levels would suggest other applications and be of considerable assistance in determining the practical limitations and advantages of metallic gas tubes for power system use. The installations described below will indicate both the progressive steps that have been taken to obtain improved performance and the progress made toward realizing in practice the possibilities offered by these electronic devices.

Thyratron Voltage Regulator Installed at Howard Substation—In March, 1930, we installed at Howard substation in Ohio a 15,000-kva. synchronous condenser equipped with a motor-generator exciter set and two "Thyratron" voltage regulator arrangements, with provisions for switching from one arrangement to the other. One was a "Selsyn"-controlled thyratron regulator and the other was an all-tube thyratron regulator. For both types of control three type FG-29 tubes were used in a three-phase, grid-controlled rectifier circuit for supplying a controllable d.c. voltage to the field of the exciter. A small pilot exciter, connected through a resistor in opposition to the rectifier output, enabled a reduction of the residual voltage of the exciter to zero and thus made the maximum lagging r.-v.a. of the condenser available.

Although both the selsyn and this particular type of all-tube method of controlling the grids of the power rectifier tubes have now been superseded,

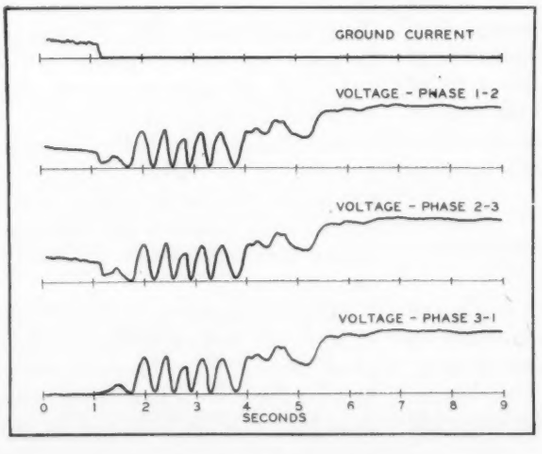


Fig. 1—Hall recorder records 132-kv. line fault
Taken at Glenlyn plant before installation of thyratron regulators. A fault on phase 3-1 (cleared just after first second of oscillogram) caused an out-of-step voltage condition lasting several seconds.

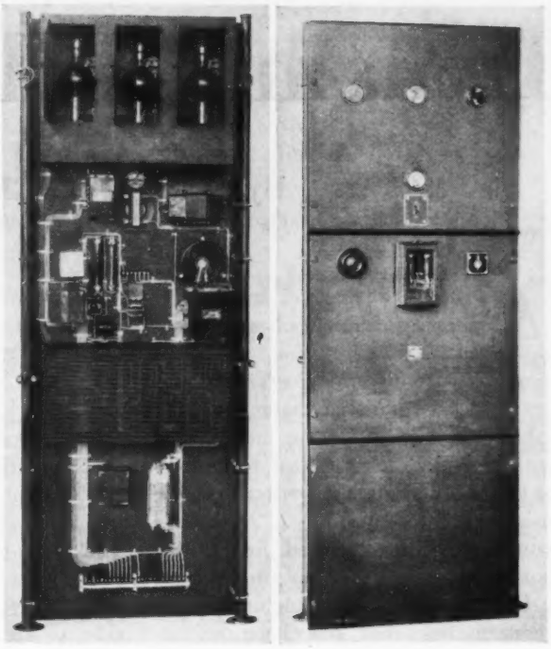


Fig. 3—Front and rear views of thyratron voltage regulator panel

The type 841 vacuum tubes may be seen on the front panel near the center. The three FG-29 thyratrons may be seen on the rear view of the panel through the open tube compartment doors near the top. A manually controlled lid (not shown) at the top of the tube compartment provides temperature control for summer and winter conditions.

nevertheless it may be of interest to review them very briefly. The selsyn control utilized a torque motor direct-connected to a selsyn phase-shifting device which provided phase control on the grids of the power thyratrons. Its characteristics were similar to those of a mechanical type regulator having a torque motor master element. The all-tube control used as a voltage determining means involves a circuit composed of a saturated and a non-saturated core transformer energized from the line voltage, the output being amplified by vacuum tubes and applied to the grids of the power rectifier tubes to provide control by changing their grid biases.

General Operating Experience—Since its installation in 1930 the regulator has had approximately 40,000 hours of service. The all-tube method of control held the regulated voltage within narrower limits and responded a little more quickly to changes in the regulated voltage than the selsyn control, but the tube life obtained on all-tube operation was rather short, due to the control circuits used, consequently only 6,900 hours of all-tube experience was obtained. It was found with all-tube control that during periods of low system voltage the condenser was overloaded due to the ceiling voltage of the regulator being applied continuously. A resistor connected in series with the output of the grid-controlled rectifier and normally shorted out with a time-delay relay corrected this condition. The arrangement limits the voltage applied to the exciter field to full load value when the system voltage is continuously low, without sacrificing quickness of response at other times.

Difficulty With Original All-Tube Circuit Determined—In the original all-tube control circuit the thyratrons were fired by bringing the negative grid bias to zero. This arrangement functioned correctly so long as the tube would fire at zero bias. However, as the tubes aged they required that the grid be made one or two volts positive before they would fire properly, and when this condition occurred it was necessary to remove the faulty tube and subject it to a rejuvenation process to restore its original characteristics. With the selsyn control positive-grid tubes could be continued in service and subsequent all-tube circuits were also designed to use positive-grid tubes.

The type FG-27 thyratrons used have a nominal rating of 12.5 amp. average, 75 amp. instantaneous peak and 3,500 volts peak. An average tube life of approximately 15,000 hours was obtained over the 4½-year period and the maximum life of any one tube was 17,800 hours.

Thyratron Voltage Regulators Installed at Glenlyn Plant—In April, 1931, we installed two thyratron regulators at Glenlyn, Va., one on a 20,000-kw. generator and the other on a 25,000-kw. generator. These regulators were installed to overcome operating difficulties due to (a) slow voltage recovery after a system disturbance and (b) out-of-step conditions following severe faults, as shown in the oscillogram of Fig. 1.

Calculations indicated that under the existing conditions at Glenlyn a new mechanical regulator and the existing shaft-driven exciter with self-excitation would provide a response of about 125 volts per second, whereas with a thyratron regulator a response of about 300 volts per second was made practical by the use of a higher exciter field voltage.

The general circuit arrangement (Fig. 2) is similar to the original all-tube regulator installed at Howard with the exception that the method of control was improved by providing for

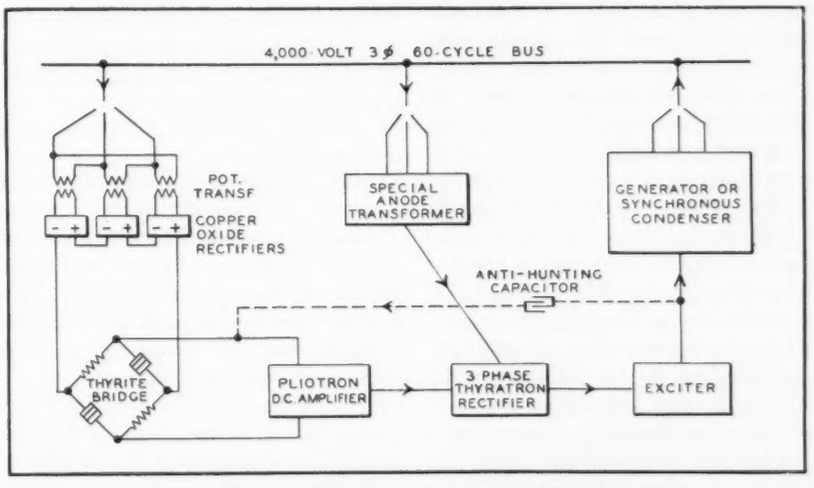


Fig. 2—Thyratron voltage regulator in schematic form

Each phase voltage is rectified separately using full-wave copper-oxide rectifiers and the three d.c. voltages thus obtained are added together to give a resultant d.c. voltage which is proportional in value to the arithmetical sum of the three phase voltages, the resultant d.c. voltage being applied to a thyrite bridge through voltage-adjusting rheostat. The use of the arithmetical sum of the three phase voltages as the voltage determining means eliminates the disadvantage of regulation from a single phase. The output of the thyrite bridge is amplified in a single-stage triode amplifier using two type 841 voltage amplifier tubes operating in parallel and is then applied as a voltage control to the grids of the thyratron rectifier, the output of which supplies excitation for the exciter field.

the firing of positive-grid tubes and by other general improvements based on the experience at Howard.

A reduction of about 1.2 per cent in regulated voltage raises the voltage supplied to the exciter to more than three times normal, making it possible to hold the regulated voltage within narrow limits as long as the capacity of the generator is not exceeded. At a predetermined value of excitation on the generator a time-delay relay cuts a resistor in series with the exciter field to prevent the generators from being overloaded and at the same time permit full excitation to be obtained during load swings lasting less than, say, 10 to 25 seconds.

During the past three years these regulators, a view of which is shown in Fig. 3, have given approximately 15,000 hours of very satisfactory operation, and except for the tube troubles noted below have required practically no attention.

It was found that during the winter months the ambient temperature at the regulators fell as low as 0 deg. C., which is outside the normal temperature limits of 20 to 40 deg. C. for most satisfactory operation of the FG-29's, and starting of the regulator therefore took longer than necessary. A manually controlled thyratron inclosure was installed which utilized the radiated heat of the thyratrons to increase their ambient temperature and consequently decrease the starting time during the winter months.

Tube failures have been of two kinds: (a) At the end of a reasonable period of life and (b) shortly after installation due to construction defects. At the time the regulators were installed there were insufficient life data to warrant a definite prediction as to expected life in this service, but it was felt that at least 10,000 hours should be obtained. Thus far two tubes failed at 12,800 hours and a third is still in service after 13,000 hours. Of the tubes having mechanical defects, the elements of one were out of alignment, causing it to fail after 235 hours; a second had an open heater and was never placed in service, and a third had a loose base, but is operating satisfactorily after 5,800 hours. These defects are associated with tube design and manufacturing methods; experience and research will undoubtedly indicate the necessary corrective measures as it has in the past in connection with the development of the higher power vacuum tubes.

Dynamic Balancing

By J. C. GAYLORD

Hydro Engineer Southern California Edison Company, Ltd., Los Angeles

AFTER many years of service and many overhauls it often happens that large rotating machines, such as hydro-electric generating units, get out of dynamic balance. The vibration caused by an unbalanced condition does a great deal of damage to the unit and attached equipment, the more common results of excessive vibration being loosened field coils, hot bearings and broken connections.

Until recently the balancing of large rotating machines has been accomplished in the field by "cut-and-try" methods. Results obtained have been dependent upon some skill and a large amount of luck. It has been a tedious and difficult problem to determine where weight should be added to or subtracted from the rotating element in order to balance it so that it would run smoothly.

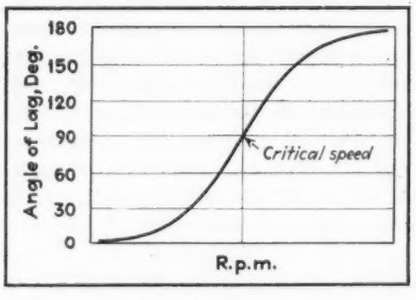


Fig. 1—Relationship between the angle of lag and the speed of unbalanced rotor

New equipment has been developed recently for solving these dynamic balancing problems with a minimum number of trials. The practical application of one type of such equipment and the results obtained in one rather difficult case of balancing a large hydro unit may be of interest.

One of the units in the Big Creek power houses of the Southern California Edison Company, Ltd., consists of a 35,000-kva., 11-kv., three-phase generator driven by a Francis-type water turbine of 375 r.p.m. Excessive vibration, apparently entirely in the generator end of the unit, had led to many attempts to balance the unit by the "cut-and-try" method, with only partial success.

When an unbalanced rotor revolves it will not rotate about the axis of its shaft, but will be swung out of line by the heavy side. At very low speeds the heavy side will swing farthest out from the axis of rotation. As the speed increases this is no longer the case, and a point a few degrees back against the rotation will swing out the most. The angle between the heavy side and this point will gradually increase until, at very high speeds, the light side, or that opposite the heavy side, will swing out farthest and the body will be rotating about an axis through its center of gravity. The angle by which the high side (the point which swings out the farthest) lags behind the heavy side is called the angle of lag. A typical curve showing the variation of the angle of lag in relation to speed is shown.

Problems in balancing then consist of three parts: First, to locate the high side as the unit runs at normal speed; second, to determine the angle of lag for the unit at normal speed (from these two the heavy side can be located); third, to determine how much weight must be added opposite the heavy side to bring the rotor into dynamic balance.

The equipment used was the Davy "Vibrometer" and "Vibroscope," the former to determine the amplitude and nature of the vibration and, in conjunction with the latter, to determine the high side and the angle of lag.

The vibrometer is, in reality, a small seismograph arranged to reflect a beam of white light on a ground-glass screen in such a way that the motion of the light spot on the screen represents, on a very large scale, the amplitude and kind of vibration imparted to the vibrometer by the unit under test. The vibroscope is a stroboscope using neon lamps, the circuit to which is interrupted by a variable-speed circuit interrupter, whose speed can be controlled very accurately. In the same circuit with the neon lamps of the vibroscope is a small neon lamp located in the vibrometer so that its interrupted beam of red light also is reflected on the ground-glass screen in the same manner as is the white light from that instrument.

The procedure is first to mark large numbers at approximately equal inter-

# of Hydro Units Simplified

New Technique Reduces Number and Improves Accuracy of Field Test Runs Necessary Dynamically to Balance Large Hydro-Electric Generating Units

vals around the shaft of the unit to be tested. These numbers are located so that they can be illuminated by the interrupted light from the vibroscope. If the light from the vibroscope is flashed on once each revolution of the shaft, the shaft will appear to stand still and the number being illuminated can easily be noted.

Now the vibrometer is set up on one end of the generator (either on a flat spot available or on a rigid bracket provided for the test) in such a way that the motion of the white light will register the vibration of the unit perpendicular to the center line of its shaft. With the generator running at normal speed the white light will trace a figure on the screen, the horizontal length of which will represent the amplitude of vibration perpendicular to the shaft, and the vertical width of which will represent the vertical vibration. This figure may take many different forms, depending on the peculiarities of the vibration of the unit being tested (see illustrations). The general form of the figure usually will be an ellipse.

The red spot on the screen from the light of the neon lamp will move around this figure in one direction or the other, depending on whether the light is interrupted more or less often than once for each revolution of the generator. If the red light is interrupted exactly once for each revolution of the generator the spot will stand still at some point on the figure.

Therefore, if we adjust the interrupter until the red spot stops at the extreme outside of the figure (away from the shaft) and by means of the vibroscope read the number on the shaft which appears exactly on the same side of the unit where the vibrometer is located, this number will be on the side of the rotor which is swinging farthest from the axis of rotation. This side of the rotor is called the "high side" or "high spot."

Knowing the speed and size of the unit being tested, the "angle of lag" can be estimated, or can be determined by making several observations at different speeds. The details of the latter method are too long for discussion here.

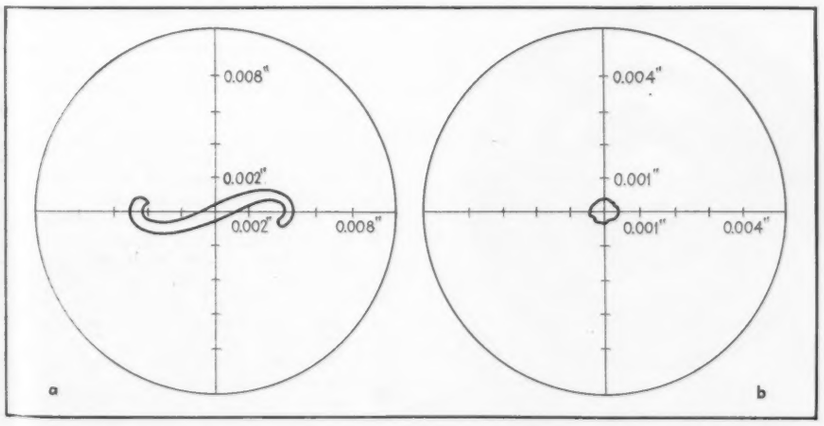
Having determined the "high spot" and estimated the "angle of lag," the next step is to add a weight opposite the heavy side of the rotor. The value of this weight must be estimated for the first trial. After this weight is added another run is made to find out what was accomplished. If the "angle of lag" has been correctly estimated or calculated the "high spot" will remain the same, or will be 180 deg. from the original "high spot" if the "angle of lag" is correct and the weight added too large to balance the heavy side. If the "high spot" moves against the rotation of the unit the estimated "angle of lag" is too large, and vice versa.

After two or three trials it will be found to be comparatively easy to estimate the locations where weight should be added and the amount necessary. Tests must be made at both ends of the unit alternately and weights added or subtracted until perfect balance is reached. For the unit in hand tests were made at both the upper and lower guide bearings.

The foregoing covers only the simplest form of unbalance. There are complications which may cause considerable trouble. In general, no matter how badly unbalanced a rotor may be, no matter if it is heavy on one side at one end and heavy on some other side at the other end, or whether it has several heavy spots in it, it can be balanced by the addition of only two weights of the proper size placed in the proper places.

The unit at Big Creek was found to have a vibration of about 0.035 in. at the lower guide bearing and about 0.005 in. at the upper guide bearing. As left, after adding two large weights, one on one side at the upper end of the rotor and one on the opposite side at the lower end, together with two or three small weights, the vibration was cut down to considerably less than 0.001 in. at each end. The vibration at upper guide bearing, as left, is shown. The unit has been running quite satisfactorily ever since.

Since this unit was balanced the vibrometer and vibroscope have been used successfully on synchronous condensers and a steam turbo unit.



Record of vibration in upper guide bearing before and after balancing

A—as found. Taken from vibrometer record of a 35,000-kva. hydro-electric generating unit. B—as left after weights had been added. Vibration has been reduced to less than one-thousandth of an inch.

Insulators Resist Rifles

Bullet Breakage Reduced by "Glance" Design Which Makes Minor Sacrifices in Leakage Path

By G. M. WHISLER
Westinghouse Electric & Manufacturing Company, Emeryville, Calif.

Reducing insulator breakage by missiles and bullets is a desirable contribution, especially if it can be accomplished without compromising on electrical design and performance. It does not happen everywhere, but where it does there is need for something to combat it. These tests show why experience in the West has been bettered in this respect in the last two or three years.

FIELD reports have indicated that insulator breakage has been largely due to shooting with small caliber rifles. Preliminary work in developing a more rugged design was on available standard suspension insulators, using a Marlin model 38 repeating rifle with 22 long cartridges. We assumed that no one would be foolish enough to stand directly under the pole or tower and shoot up at the insulators, and therefore chose an angle of 30 deg. from the axis of the insulator and a distance of 60 ft. for the line of fire. For convenience in recording hits and the results, the insulator under test was balanced on the ground with the axis of the insulator horizontal and the cap at the back supported to maintain this position. Our data were recorded using hour hand positions for the radial location of the hit and a letter to indicate the exact point (Fig. 1). Thus, a hit at the very top edge would be A-12, at right edge A-3, etc. Preliminary tests indicated definitely:

1. That a standard shape and weight of suspension shell would not withstand such shooting (Fig. 2a).
2. That ruggedness could not be obtained merely by increasing the thickness and weight of the shell.
3. That the shape of the shell was a very important factor. It should be such that the bullet will be deflected and not exert its full force at the point of impact.

Shells were produced designed to incorporate the features found necessary in our preliminary tests and subjected to the shooting test with results as indicated by Fig. 2b. The data taken from shooting tests, results of which are shown in Fig. 2, are shown in Table I. In all of these tests no conductor or clamp was in position. This made the units more vulnerable than in service, since the clamp and conductor would protect about half of the shell.

From the results of several tests on the type of units shown in Fig. 1b the following points were determined:

1. On random hits, as for example those listed in Table I for Figs. 1 and 2, units will successfully withstand more abuse than should be expected in service.
2. The bullets are definitely deflected and do not exert their full impact force at the point of first contact with the porcelain. Some of the lead paths indicated that the bullet was deflected over as much as 3 in. of surface and then left the porcelain. This action is best shown in Fig. 7.
3. Repeated direct hits at or near the same spot, particularly points *A* or *C* (Fig. 1) may result in relatively small breaks, which rarely extend in further than point *C*, retaining the bulk of the insulating value.

This development work on suspension insulators was completed about

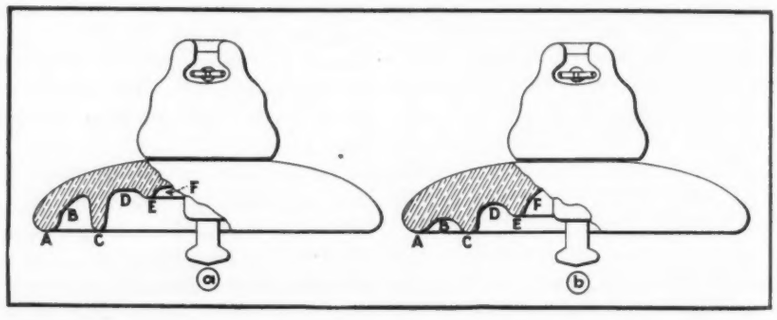


Fig. 1—Design b resists impacts better than a

Letters indicate points of hit cited in Table I. "Hour hand" time used there to indicate angle of incidence.

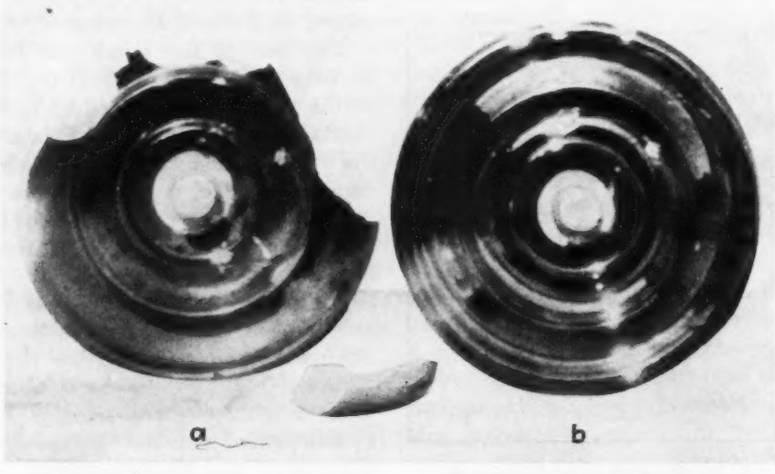


Fig. 2—Glance design (Fig. 1 b) deflects impact without breakage
After twenty shots there was only a bit more chipping of glaze than shown here for ten shots.

three years ago and met with favorable response almost immediately. To date Western utility companies have purchased several thousand units. The contractor who installed the bulk of these reported very favorably on this design. We have had no reports so far of breakage from shooting or stone throwing on the lines using this design (Fig. 1b).

Pin type also modified successfully

Following the work on the suspension type insulator consideration was given to the pin type. Fig. 4 shows three pin-type insulators on which shooting tests were run. Ten shots for each unit were made with hits as indicated in Table II.

The illustration in Fig. 4 shows the condition of these insulators after the shooting test and correspond to design details shown in Fig. 3, units a, b and c, respectively. Units b and c of Fig. 3 were existing standard insulators. Unit a was produced to meet the requirements found necessary in the work on suspension insulators. This unit happens to be a one-piece design, but similar results could doubtless be obtained in standard multi-part designs.

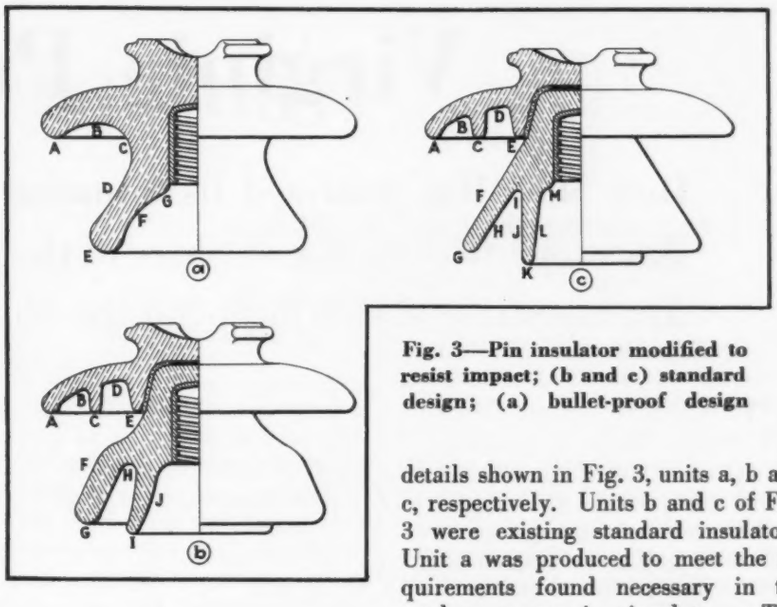


Fig. 3—Pin insulator modified to resist impact; (b and c) standard design; (a) bullet-proof design

The work done at present indicates that designs can be produced which will stand considerably more abuse from shooting, handling or stone throwing than previously existing designs. The features involved add to the weight and sacrifice some leakage distance for a given height and diameter of insulator. This is shown by the following table of data for both designs:

Suspension Type

Unit	Fig. 1 a	Fig. 1 b
Weight (lb.)	11	13
Leakage (inches)	10⅝	10½

Pin Type

	Fig. 3 a	Fig. 3 b	Fig. 3 c
Weight (lb.)	10⅞	10½	9¼
Leakage (inches)	13	19¼	18

Because of this leakage distance loss the new units should only be used where breakage is a serious problem and the lost leakage distance can be sacrificed safely.

Table I—Chipping Only Damage to Reinforced Design

Hit No.	Fig. 1a	Results	Fig. 1b	Results		Fig. 1b	Results
1	E- 5	O.K.	EF -12:30	O.K.	11	C- 2	Chipped glaze
2	B-12	Broke	ED-12	O.K.	12	C-11	Chipped glaze
3	B-11	Broke	D-11	O.K.	13	F-12	O.K.
4	E- 5	Glanced to D-5, chip	D- 1	O.K.	14	F- 9	O.K.
5	C-1	O.K.	CB- 1	O.K.	15	E-10	O.K.
6	E-1	O.K.	CB- 1	O.K.	16	ED- 8	O.K.
7	D- 2	Large break	BA- 4:30	O.K.	17	EC- 2	O.K.
8	B-10	Large break	F- 6	O.K.	18	CB- 3:30	O.K.
9	E-11	O.K.	A-12	Chipped glaze	19	E- 6	O.K.
10*	E- 5†	O.K.	A- 1	Chipped glaze	20	D- 2	O.K.

*Photograph for Fig. 2 taken after this shot.
†No further tests in this unit.

Table II—Pin Insulators Also Made Impact Proof

Pattern	Fig. 3a		Fig. 3b		Fig. 3c	
Hit No.	Location	Result	Location	Result	Location	Result
1	CD- 9	O.K.	B- 8:30	Broke 11-B to 6	C-11	O.K.
2	G- 7	O.K.	E-10	O.K.	E-10	1-in. chip
3	B-11	O.K.	DE- 9	Broke 6-D-10	D-11:30	O.K.
4	E- 9	Glaze chip	ED-12	O.K.	D-11	Broke 10-D-2:30
5	B- 7	O.K.	ED-11:30	2/3 of head	B- 9	Broke 10 to 5
6	C- 7	O.K.	G-10	Broke 10 to H to 6	I- 6	Broke G-9 to 1-7 to G-5
7	E- 8	Glaze chip	J- 3	O.K.	JI- 1	Broke G-11 to II to G-4
8	B-12	O.K.	HI-11	O.K.	I- 9	¾ of center petticoat
9	C-11	O.K.	GH- 1	O.K.	.....	Test stopped
10	A- 9	O.K.	H- 2	Broke ½ off center	.....	Test stopped

For result: See Fig. 4a. See Fig. 4b. See Fig. 4c.

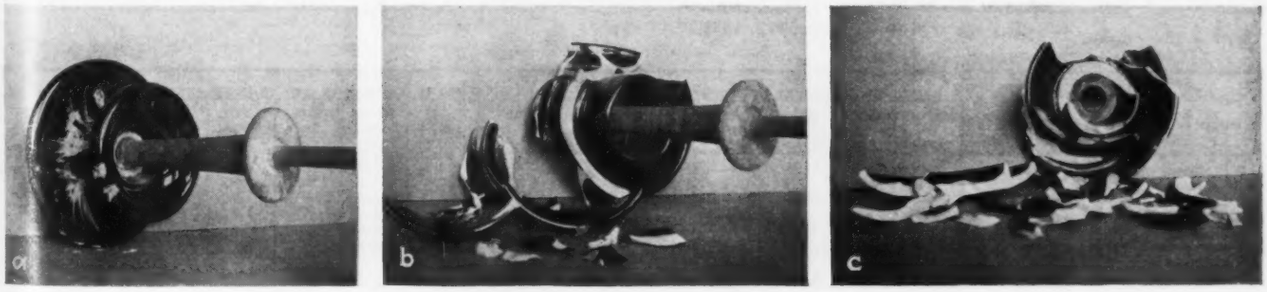


Fig. 4—Shattering overcome by sturdier pin insulator

Virginia Prepared for

How State Has Analyzed Its Situation so It Will Have a Basis for Claiming a Just Share of the $100,000,000 Federal Appropriation and Will Spend the Money Most Effectively

FEDERAL allotment of $100,000,000 to P.W.A. for extension of rural electrification has aroused considerable interest and questions in various circles. For example: (1) How will it be allocated among the states—on the basis of total number of unserved farms, miles of farm line that can be erected with the best prospects of energy usage, etc.? (2) Will the allocations to states have to be balanced by proportionate local appropriations and what will be the terms of the federal loans? (3) What will be the basis for determining where rural lines will be built? (4) Who will specify construction standards to avoid excessive outages and service maintenance expense and permit the lines to operate in conjunction with existing sources of supply? (5) Who will erect the lines—contractors, farmers or utilities? (6) Will the lines be turned over to utilities on some basis to operate and maintain or will these functions be performed by some state organization? (7) If the former, how will utilities be relieved of legal responsibility for hazards of construction they have not specified?

Virginia is one state that has taken the initiative in trying to get these questions answered in a sensible way, by making a survey of existing rural service and the economics of additional lines. This has been done under the sponsorship of the State Corporation Commission by the consulting firm of Slaughter, Saville & Blackburn of Richmond, working in co-operation with the best existing sources of information. A plan is now being considered by Virginia for handling the construction and operation of rural lines built under federal appropriation.

Since some rather favorable comments on this survey and plan have been heard from various interests, and since Washington authorities have sent copies of the report to other states as examples of the information wanted, some significant aspects of the Virginia approach and study will be presented here.

Very sensibly, the commission and its consultants concentrated their study on farms which utility surveys had previously shown could not be served with sufficient revenue to justify the investment, thus leaving to private initiative the development of rural lines that are economically sound and confining government subsidy to those which could be served only by that means.

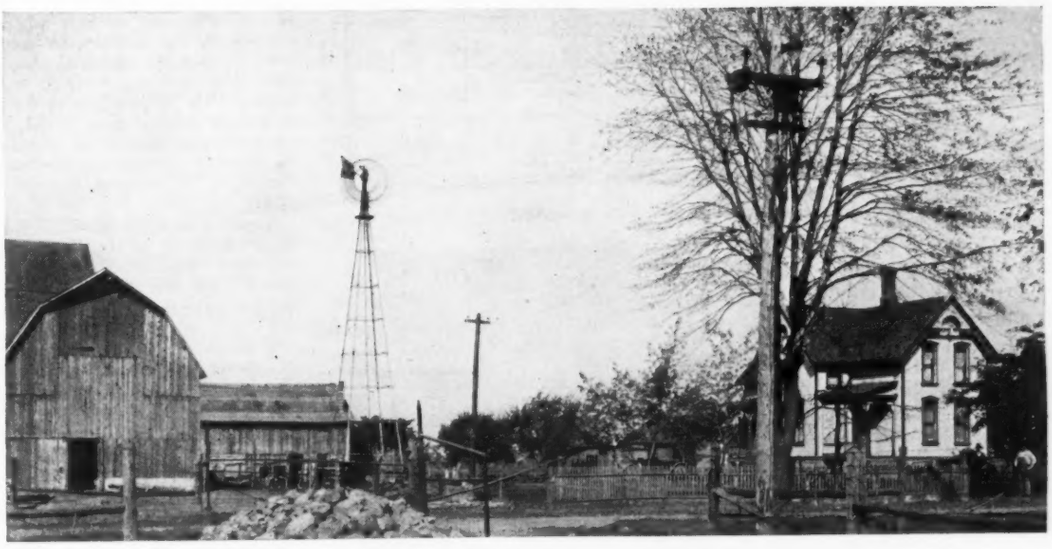
Instead of working independently of all authorities which have accumulated facts and experience regarding rural electrification, the commission consultants corraled their assistance and data, thereby avoiding what would otherwise have been useless duplication. Among the collaborators were C. E. Seitz, professor of agricultural engineering Virginia Polytechnic Institute; county agents from practically all counties in the state, and all the agricultural engineers of all the utility companies, as well as many of their technical men familiar with this work. Through the Associated Press persons interested in rural line extensions were induced to communicate with the commission. The consultant's staff was also supplemented by quite a number of white-collar workers furnished by the Virginia Director of Federal Relief. With this staff 96 per cent of the counties were surveyed in one month,

	COUNTY	NUMBER OF PROJECTS	NUMBER OF MILES	RATIO OF CONSTRUCTION COST TO ANNUAL REVENUE - (6 TO 1) NUMBER OF PROJECTS	NUMBER OF MILES	NUMBER OF CUSTOMERS	CUST. PER MILE	COST OF CONSTRUCTION	ESTIMATED ANNUAL REVENUE	RATIO OF CONSTRUCTION COST TO ANNUAL REVENUE - (7 TO 1) NUMBER OF PROJECTS	NUMBER OF MILES	NUMBER OF CUSTOMERS	CUST. PER MILE	COST OF CONSTRUCTION	ESTIMATED ANNUAL REVENUE
1	Accomac	18	35.9	3	1.4	14	10.4	$ 2,430.	$ 475.	—	—	—	—	—	—
2	Albemarle	16	53.8	5	21.3	147	6.9	25,773.	5,112.	1	1.6	5	3.3	$ 1,900.	$ 250.
3	Alleghany	9	42.7	1	0.5	8	16.0	760.	240.	—	—	—	—	—	—
4	Amelia	5	16.2	4	12.1	29	2.4	14,460.	2,628.	—	—	—	—	—	—
5	Amherst	13	54.9	2	1.1	14	12.7	1,496.	782.	1	1.0	11	11.0	1,710.	252.
6	Appomattox	13	55.2	1	9.0	28	3.1	8,460.	1,692.	—	—	—	—	—	—
7	Augusta	13	45.4	1	2.8	15	5.4	3,450.	900.	—	—	—	—	—	—
8	Bath	4	26.7	2	18.2	82	4.6	21,840.	3,324.	1	7.0	40	5.7	8,400.	1,200.

	COUNTY			RATIO OF CONSTRUCTION COST TO ANNUAL REVENUE - (8 TO 1) NUMBER OF PROJECTS	NUMBER OF MILES	NUMBER OF CUSTOMERS	CUST. PER MILE	COST OF CONSTRUCTION	ESTIMATED ANNUAL REVENUE	RATIO OF CONSTRUCTION COST TO ANNUAL REVENUE - (9 OR MORE TO 1) NUMBER OF PROJECTS	NUMBER OF MILES	NUMBER OF CUSTOMERS	CUST. PER MILE	COST OF CONSTRUCTION	ESTIMATED ANNUAL REVENUE
1	Accomac			—	—	—	—	—	—	12	32.5	170	5.2	$ 57,601.	$ 4,274.
2	Albemarle			2	5.5	6	1.1	$ 6,600.	$ 820.	8	25.5	45	1.8	30,900.	2,550.
3	Alleghany			—	—	—	—	—	—	8	42.2	157	3.7	83,280.	4,200.
4	Amelia			—	—	—	—	—	—	1	4.3	8	1.9	5,100.	432.
5	Amherst			—	—	—	—	—	—	10	52.8	187	3.2	71,474.	4,812.
6	Appomattox			1	0.9	3	3.3	846.	96.	11	45.5	128	2.6	40,232.	2,822.
7	Augusta			2	5.0	20	4.0	6,184.	750.	10	37.6	80	1.8	46,200.	3,276.
8	Bath			—	—	—	—	—	—	1	11.5	25	2.1	13,800.	768.

Rural projects divided into four economic classes

Rural Extensions



actually field checking nearly 19,000 miles of road.

As a base from which to work, a set of county highway maps was turned over to each utility for plotting its existing transmission and rural lines and, in different color, lines which it had studied but found uneconomical to construct. After transferring this information to smaller-scale maps, which could be handled in the field, experienced engineers, aided by county agents, and white-collar workers, collected data on proposed line extensions. The county agents were used primarily to secure information on the economic conditions of the different farmers and their capacity to pay.

The working data from which subsequent studies were made included three major groups: (1) Existing lines; (2) lines previously surveyed; (3) lines surveyed for this report. The data under each group were classified by county and service company. Data on number of miles of line, total customers and customers per mile were tabulated for each of these groups. Except for existing lines, data were also tabulated for estimated cost of lines, estimated annual revenue and the ratio of these two items.

While this complete breakdown was essential to the study, it will suffice to give only a few highlights:

A little more than 5,800 miles of rural line now serves more than 38,000 customers, or an average of 6.5 per mile, but the number of miles in each county and the customer density in different lines varies over a wide range. For example, the 122 county groups of lines analyzed had an average aggregate length of 47.2 miles, but ranged from 0.2 mile to 240 miles. And the customer density ranged from 0.7 to 16.6 per mile.

Considering lines previously surveyed but not found economical by utilities, 2,475 miles would serve 10,187 customers with an average density of 4.1 customers per mile, but it was estimated that nearly $3,350,000 would have to be spent on the lines to obtain an estimated annual revenue of less than $321,000—only 9.6 per cent gross return. This makes no allowance for the fixed and operating costs of delivering power to the rural lines, and of course would be diluted by the operating and maintenance expenses on the rural lines and by the various expenses of handling rural customer accounts.

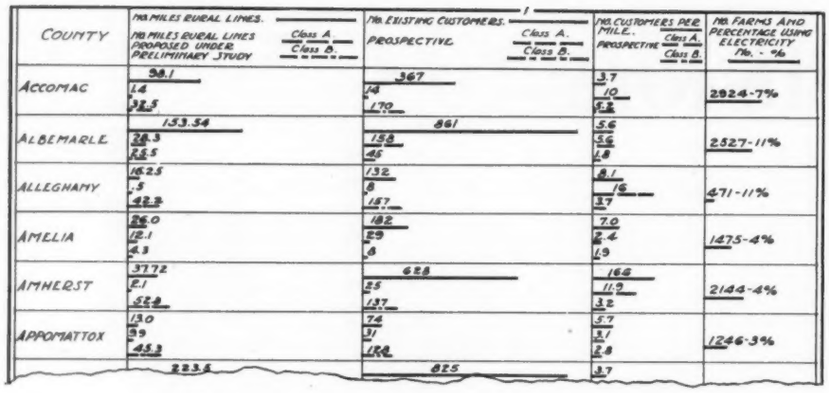
The one hundred county-group lines of this character averaged 24¾ miles in length, ranging from 1.1 mile to 95 miles, with densities ranging from 0.3 to 12 customers per mile. However, the high densities were confined to only a few short lines. The report indicates that the minimum cost per mile was $750 for a 2,300-volt, single-phase line and higher costs for 6.9 and 13.2-kv., three-phase lines. The average cost per mile for this group was $1,350.

Additional routes surveyed for this report presented still another picture and involved 3,457 miles reaching 15,200 customers, or an average density of 4.4 customers per mile. It was estimated these would cost nearly $4,503,000 and bring an annual revenue of slightly more than $472,000, or 10½ per cent gross revenue. This group of lines also showed wide variations in conditions. For example, the 89 county groups averaged 38 miles, but their lengths ranged from 4⅝ miles to 97¼ miles. Density ranged from 1.7 to 7.7 customers per mile, with the ratio of estimated annual revenue to line cost ranging from 4.3 per cent to 25 per cent.

The report warns that the figures on some of these lines will have to be discounted, as some information was compiled by inexperienced men and because prospective users are always more optimistic on prospects of receiving something than they are when asked to sign on the dotted line regarding the amount they will pay per month for energy.

Projects analyzed by economic value

Reclassification of all unserved routes on the basis of ratio of estimated line cost to annual revenue was



County	No. miles rural lines. No. miles rural lines proposed under preliminary study	Class A / Class B	No. existing customers. Prospective	Class A / Class B	No. customers per mile. Prospective	Class A / Class B	No. farms and percentage using electricity. No. - %
Accomac	38.1		367		3.7		
	1.4		14		10		2924-7%
	92.5		170		5.2		
	133.54		861		5.6		
Albemarle	28.3		138		5.6		
	2.5		45		2.8		2527-11%
	16.25		132		8.1		
Alleghany	.5		8		16		
	42.3		157		3.7		471-11%
	26.0		182		7.0		
Amelia	12.1		59		2.4		
	4.3		8		1.9		1475-4%
	37.72		628		16.6		
Amherst	2.1		25		11.9		
	52.8		137		3.2		2144-4%
	13.0		74		5.7		
Appomattox	39		31		2.1		
	45.3		182		2.8		1246-3%
	223.5		825		3.7		

How rural situation in counties was graphed

employed to give a better conception of the extent and location of lines that might be built under some kind of grant or more liberal plan than it is possible or practical for utilities to extend to prospective customers offering small revenue. Ratios of 6:1, 7:1, 8:1 and 9 (or more) :1 constituted the major classification. By county, it was then possible to list for each class the number of projects, mileage, number of customers, customers per mile, cost of construction and estimated annual revenue.

Considering all classes, a total of 1,243 projects distributed over 100 counties and requiring 5,895 miles of lines, or an average of 4¾ miles per project, would be involved to reach unserved farmers in Virginia. Segregated into economic groups the general situation as presented to the commission is as shown in Table I.

To give the commission a birdseye view of existing rural lines as well as relative prospects for extensions in all of the 100 counties, graphic presentation, a sample of which is shown, was employed. Prospective lines are divided into two classes, A and B, the former indicating those which the consultants believe can be constructed within the next two years under some form of subsidy. Class B lines involve all that fall short of the return on investment required by any plan available at present, but which later might be considerably modified by a more liberal plan than that assumed for Class A lines.

Plan of operation with subsidy

Without any subsidy, the consultant's report states, only those lines with a ratio of cost to annual revenue less than 6:1 can be considered. If, however, some form of public financing or subsidy is developed, then perhaps a large part of the 7:1 class lines and possibly some of the 8:1 class might be built. By a still more liberal subsidy over a period of five years or more a large number of 9:1 class lines may be built.

In case there is available public financing or subsidy, the commission's consultants suggest:

That a non-profit corporation be set up composed of representatives of those groups in Virginia most vitally interested in this project. The stock of this corporation should be all held by some designated agency of the state without any liability as to assessment so that any indebtedness created by the corporation would have behind it only the physical properties owned by it and revenues received from its operations. This corporation to have the power to borrow money, plan, build, lease, sell, or operate rural lines, and do all other things necessary to perform its functions, including the right of eminent domain for right-of-way.

Under this corporation, if formed, should be grouped all of the lines proposed under all these classifications in order that revenues from the more profitable lines can be used to support temporarily the less profitable lines.

If there is to be quick development of use of power we believe some consideration should be given to financing that part of the work necessarily done by the property owner, such as his own service line of more than 100 feet from highway or line, the wiring of his own premises, and possibly the purchase of appliances. These are considerable items of costs that can now be financed under Federal Housing Administration repair and renovation loans, but over a long period some other financing may be necessary.

The report concludes by pointing out that in making estimates of costs of lines a unit value of about $1,325 was used. It includes cost of transformers and incidental equipment necessary, but does not include right-of-way, because it was believed this would be granted or that roads might be used. This unit cost would vary under different conditions prevailing in the state, but the consultants consider it a safe figure for estimates.

Before any construction is started, the consultants warn that a more detailed study should be made of each individual line and subscribers signed up on a binding contract. Furthermore, they suggest that additional facilities be provided by Virginia Polytechnic Institute, where experimental and promotional work can be carried on to assist farm electrification.

Table II — Projects Divided Into Favorable and Less Favorable Classes

Class	Miles of Line	Customers	Cost per Mile	Cost of Construction
A.....	1,842.55	10,591	5.7	$2,319,843
B.....	4,069.6	14,402	3.5	5,466,738

Table I—Summary of Projects by Economic Value

Ratio Cost: Revenue	No. of Projects	Miles of Line	Miles per Project	Customers	Cust. per Mile Aver. Range	Construction Cost (est.)	Annual Revenue (est.)	Range of Gross Revenue (%)
6:1.....	270	938	3.48	5,734	6.1	$1,168,342	$223,201	14.3–16.7*
7:1.....	160	417.4	3.93	2,372	5.7	570,560	74,765	12.5–14.3
8:1.....	93	470	5.05	2,421	5.2	578,741	71,437	11.25–12.5
9 (or more):1 ..	774	4,069.6	5.25	14,402	3.5	5,466,738	408,362	3–11
Total.....	1,243	5,895	4.75	24,939	4.23	7,784,381	777,765	

*Less than 1½ per cent per month, compared with minimum requirement of one large utility of 1¾ per cent per month for four years.

Arthur and Gwendolyn Marry

But "Gwen" Doesn't Know About the Public Relations Adviser!

By EDWARD A. CONNELL
Stamford, Conn.

IT IS really quite ironical that "public" utility companies, which by very virtue of their intimate relation to Mr. and Mrs. Public should be experts, *par excellence,* in the art of public relations, stand sorely in need of some awfully fundamental coaching in the field of elbow-rubbing.

Some day I hope that I can find the man who coined the term "public relations" and tell him what I think of him. In my opinion there is nothing more dangerous for a beleaguered utility executive to do than to create the post of public relations director, announce this dramatically and sit back and wait for the marvelous results when the P.R.D. rubs his magic lamp, unwraps his bag of tricks and goes to work.

There is only one policy to follow that is sane in the emergency cases where drastic action is necessary, where demagogic politicians are turning the fire of their Big Berthas on the "arrogant" lighting company. This one policy might be summed up succinctly in the story of Arthur and Gwendolyn.

Arthur is 21. He realizes that he isn't getting to "first base" with the adorable and petite Gwendolyn. Gwen is bored, unresponsive. Then Arthur conceives a swell idea. He calls Gwen one June night when the moon is mellow and a gentle breeze is stirring. "Gwen," he declares proudly, "I've engaged an expert in courtship to help me out. From now on things are going to be different. This adviser is going to *make* you see my good points! Gee, we'll be married soon and there'll be no more friction!"

Being no different from the maids of 1487, 1869, 1935 or 2032, Gwendolyn will answer, "Oh, is that so? Well, just go ahead and spring this expert on me! See what will happen!"

Now, Arthur could have taken his troubles to a sympathetic, understanding man in a quiet way. This learned gentleman, knowing both Arthur and Gwen, might proceed as follows:

"Listen, Art, you'd get along better

with Gwen if you weren't so *perfect.* No girl likes a man to be too A-1, particularly when she isn't contemplating matrimony. Be human. Don't be forever telling Gwen what a big success you are. Give her a chance to feel sorry for you occasionally. Get down in the dumps now and then. Lord knows you've got reasons enough! Let *her* know this, though. And don't take her for granted. And you might lay off cutting in on all the girls at the country club dances, too. And admire those swell evening gowns Gwen wears."

So Arthur ponders the advice and goes back to the fray. And the program works out, but Gwen doesn't know that Art called in a public relations adviser.

In other words, don't telegraph your punches. You utility people are like Arthur. You are fighting for the good will and admiration of the fickle lady. Fundamentally, like Arthur, you've "got what it takes." You are sincere, earnest, courteous, etc. But, as every girl will endlessly repeat, "it's the little things that count." The general public feels the same way. Public good will can be won and held even in these days of T.V.A. and Boulder Dam if some old-fashioned technique is used.

To be specific. Don't be too *perfect.* Here is the besetting sin of the utility. Everything clicks too divinely. The consumer, John Doe, with his little domestic troubles, financial worries, moods, disappointments, etc., is only tantalized by your artificial perfection. It aggravates him. It gives him a feeling of dissatisfaction. The information he gets regarding your company is likely to be a flat, chilly, efficient news story written by some one who thinks he understands human nature, to the effect that "the Podunk Electric Company is installing a new super-gadget that is practically superhuman and will reduce outages, interruptions, etc., to zero." If interruptions are eliminated your consumers will appreciate it. Perhaps they never talk to you about it, but they discuss it among themselves. But, for heaven's sake, tell of your troubles, mechanical and otherwise, once in a while. I've heard the boys making the air blue in a substation when something goes wrong. If you could get these wails, toned down, into print occasionally, just to let the public know that you have your headaches, you'd find more sympathy.

Don't your officials and executives *ever* get sick or injured? Do they *ever* sustain bereavement? This does sound rather emotional and crude, but it brings up an important point. *I have never recalled reading or hearing that the utility officials in the four communities where I have lived during the past twenty years were ever injured, ill, bereaved or otherwise subjected to the common miseries of man!* This does sound far-fetched, but take a few minutes to check up on my statement. While Consumer X is suffering from asthma and Consumer Y is lying in bed with a broken leg, they feel no bond of sympathy with the fabulous, eerie, inhuman "Men Like Gods" in

the local utility organization who are, apparently, highly mechanized robots without nerves, livers or emotions.

Just recently a good friend of mine, a prominent utility executive, lay seriously ill for two weeks. I found out about it only accidentally. But I continually read in the papers that he is addressing some technical society or other on the "Ohms and Arcs" or that he is contributing a paper to a technical journal on "The Convolutions of the Papier-mâché Turbine." But I didn't read the very legitimate news item that my friend, like many another human being, is subject to colds, sore throat and general disability.

To make my point clearer, what do you think the general effect on the consumer will be when he scans *Electric Light and Power* for July, 1934, and sees on page 17 a photograph of Floyd L. Carlisle and George A. Ranney, captioned "Two Giants." "Giants, huh! Well, they won't giant me," thinks Mr. Ordinary Citizen and, without figuring the low cost of current, he joins the mob and shouts about the grasping "utility giants." And why shouldn't he?

Don't be so *grand,* you utility officials. You are human, but because of some inane tradition inherent in your calling you love to suppress all human weaknesses and live and move in a world of Utopian perfection where errors are never made and personal discomforts don't exist.

But don't take my advice too literally and clutter up your local newspapers with weird tales of sickness, death and misfortune. Do this much; think it over. Play a little poker, argue at baseball games if you don't like that rotten decision at third base, show your *feelings* once in a while.

Another thing. Begin to admit some of your mistakes and to confess your very honest desires. Our local company has just announced a plan for the eventual reduction of rates. I read the plan over a dozen times and it is still hazy. According to the announcement:

> For twelve months beginning December 1, 1934, 25 kw.-hr. of increased use will be given free for each 5 kw.-hr. of increased use purchased up to a limit of 50 free kw.-hr. per month for each customer. The usage in the corresponding month of the previous year, or in October, 1934, will be the basis for computing the free kilowatt-hours, adjusted, where necessary, to meet the intent of the offer (that is, an increase after December 1, 1934, in regular usage).

There it is. How do you like it? Informative? Warm? Friendly? I doubt it.

The announcement goes on to say that "greatly increased domestic usage in the community should also result in rate reductions to commercial and industrial customers being made sooner and greater than would otherwise be possible."

Nowhere is there any frank statement as to (1) *why* the utility is anxious to increase the production, or (2) *how* increased usage results in lower rates. Oftentimes it is good psychology to admit certain things. There is nothing that will elicit sympathy from a jury any quicker than the following old classic admission by the skilled lawyer:

> Gentlemen of the jury, I am not going to pretend that my client is not guilty. He *did* commit this act, even as you or I, when confronted with a similar situation, would commit it. But, gentlemen, *let me tell you why* my client committed the act.

A desire to increase usage is not a criminal thing. Don't be suspicious of your consumers and the manner in which they will interpret your statements. Tell your public that you want to increase production or usage so that you *both* will benefit. Tell them that you want to cut rates, but that if you can cut them and still retain a legitimate margin of profit you are going to do this. Your consumers will accept your reduction without suspicion if you admit that *you* expect to benefit as well. They are mighty wary of the Santa Claus variety of rate cut. You've been preaching that you can't give flat rate reductions and still stay in business. Tell them how you can give a rate reduction by increased usage and still stay in business, but please make it clear and honest.

Avoid obvious bids for good will. Sometimes I think that the relations between the utilities and the public were more healthy before the advent of the sugary type of consumer relations. Palavering, letters of congratulations—all of this is looked upon with a skeptical eye and a questioning mind. Falling all over consumers who have unreasonable complaints and telling them that you agree that they are 100 per cent right, etc., when you really want to tell them where they are wrong—all of this is silly. Don't be *over-active* in your Community Chest and charity drives. Don't turn over your elaborate auditorium to *every* banquet group. In fact, if you are wise, you'll convert that elaborate auditorium into an employees' recreation room and save yourself a lot of trouble.

Avoid secrecy. Let the consuming public in on your business set-up, including holding company, superpower, directors, etc. And if John Jones, one of your truck drivers, is arrested for reckless driving don't get hysterical and run around trying to hush it up. Let them put it in the paper. It's true, isn't it?

This country still respects a fighter. Explain your case forcefully and don't pull your punches. Get into comparisons more. Show the relation between the cost of the daily package of cigarettes and the daily gas and electricity. Mention the cost of the gallon of gasoline, of meat, milk, etc. Don't be timid. The housewife will recognize the truth of what you are saying. Take on the "monopoly" bugaboo. Remind people that the price of a gallon of gasoline goes up simultaneously in nine or ten different stations. Cigarettes? The same story. Are these monopolies? No regulatory commission to say a thing about them. We just take it. These comparisons will start people thinking.

Perhaps it is too late for advice on public relations. I doubt it. I think that the tide of public opinion is swinging. People are a little fed up on the "taxless town" theme. "There is a tide in the affairs of men . . ." wrote Shakespeare. Public utility companies have learned a lot in the past few years. But the American people are not content to watch three or four men jump up and down on one man when he's been down too long. They want this man to get up and fight.

Don't let the title prejudice you. It fits the allegorical introduction to a vital problem which will be rapidly revealed and discussed. The dramatic treatment of a common problem in human relations conveys its message better than oratory, logic or preachment. Keen analysis of human traits and reactions is displayed by the author, whose comments are extremely stimulating. Even if you cannot agree with all of his statements, they do contain a lot of good common sense. The author is an experienced analyst of human relations.

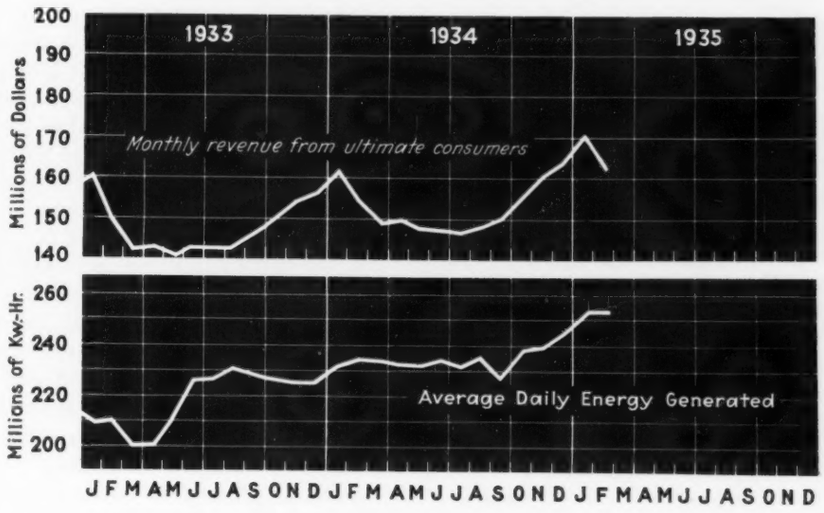
Utilities Hold Gain Over 1934

Revenues remain about 5 per cent higher than last year, energy sales are up 7.4 per cent; wholesale use largest for any February since 1930

CENTRAL-STATION operations continue month by month to be well ahead of those for the corresponding period a year ago. The aggregate revenue for February, reported tentatively by the Edison Electric Institute as $162,469,900, was 4.9 per cent greater than in 1934, against a similar rise of 5.0 per cent in January and 2.4 per cent in December. The energy generated, 7,077,000,000 kw.-hr., exceeded last year's output for the month by 7.6 per cent. As is usual at this season, both figures receded somewhat from the January peak.

Comparing like months, the total February energy sales to ultimate consumers were exceeded only once. That was in 1930, and the excess was only a little more than 1 per cent. Revenue, however, was surpassed in each year from 1929 to 1932 and the present shortage as against 1930 is nearly 7 per cent.

The increase in production from water power, amounting to 33.1 per cent, was so great that it not only covered the entire additional demand but permitted a reduction of 4.5 per cent in the output from fuels.



Domestic rate now 5.26 cents

Sales to domestic consumers were the largest for any February on record, 7.9 per cent more than in 1934, though down 8 per cent from January with lengthening daylight. For the twelve-month period the average annual consumption increased 4.9 per cent to 637 kw.-hr., from 607 kw.-hr. for the equal period ended February, 1934. The average rate dropped 3.7 per cent to 5.26 cents. The average monthly bill rose 3 cents, from $2.76 to $2.79.

Sales to small commercial consumers were up 7.9 per cent from last year and within 3 per cent of the month's record, made in 1930, with a seasonal decline, also of 8 per cent, from January.

The strongest rise in any consumer group was the 9.6 per cent reported for large commercial power and light. Sales in this class were larger than for the like month in any year since 1930. They were only 1 per cent less than in January and the average daily consumption was probably greater in the shorter month. Because the work of meter reading during the three unequal months is often equalized an exact comparison is not feasible.

Table 1—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1935	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
February	162,470†	+4.9	7,077	+7.6	2,844	+33.1	4,233	—4.5
January	170,101	+5.0	7,866	+9.6	3,126	+11.0	4,740	+8.8
1934								
December	163,807	+2.4	7,601	+8.7	3,039	+18.6	4,562	+8.7
November	160,451	+4.2	7,203	+6.3	2,801	+20.4	4,402	—1.0

Table II—Regional Revenue and Energy Output in February, 1935

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers†		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	162,470	+4.9	7,077	+ 7.6	2,844	+33.1	4,233	— 4.5
New England	13,952	+2.4	496	+ 5.0	242	+43.7	254	—16.5
Middle Atlantic	48,995	+6.1	1,811	+ 1.9	576	+31.2	1,235	— 7.2
East No. Central	38,027	+5.3	1,724	+ 6.2	173	+47.5	1,551	+ 2.8
West No. Central	13,773	+5.1	483	+16.5	152	+87.0	331	— 0.9
South Atlantic }	20,274	+4.0	856	+13.3	543	+88.5	303	—35.3
East So. Central }			328	+42.0	283	+75.2	45	—35.3
West So. Central	8,539	+3.7	326	+ 6.0	24	+152.0	302	+ 1.2
Mountain	4,549	+7.4	223	+11.8	156	+ 0.1	67	+54.3
Pacific	14,361	+3.8	830	+ 4.6	695	— 3.2	135	+79.5

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.
†Preliminary.

Table III—Allocation of Energy February, 1935

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,048	+ 6.7
Lost in transmission, etc.	855	+ 1.5
Sold to ultimate consumers	6,193	+ 7.4
Domestic	1,211	+ 7.9
Com'l, small light and power	1,164	+ 7.3
Com'l, large light and power	3,103	+ 9.6
Municipal street lighting	213	+ 5.4
Railways—street, interurban	391	+ 0.8
Railroads—electrified steam	62	+ 0.7
Municipal and miscellaneous	49	—34.1

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

One of a Series of Intimate Talks with Industry Executives

Hodge Counsels Directed Sales

An Interview by
FRANK R. INNES

"NO, I HAVEN'T any formula to offer. I haven't any life lines to fling out to the struggling electric utility industry to drag it back to safety."

Now these words are very strange words indeed, because pretty nearly every man you meet, whether he is in the electric utility business or not, knows exactly what the power companies must do to turn the distrust of critics assuming to represent the public into a deep feeling of affection and regard. Opinion, direction and advice on how to save the industry are to be found on every hand. The difficulty, indeed, is not to find them, but to keep from finding them. So it was refreshing, not to say startling, to find a man, particularly a man whose opinion you hoped to put into print, who calmly and positively stated that he did not have the answer.

Several weeks ago W. H. Hodge completed 25 years of service in the Byllesby Engineering & Management Corporation. Before he went to work for Colonel Byllesby, Bill Hodge was a newspaper reporter, and if he can be taken as typical it can fairly be said that newspaper reporters make good electric utility executives. He has been active in the industry for many years and has an interesting point of view on present utility affairs.

"What shall it profit a man to build up a business for the government to take away from him? This is the question," said Mr. Hodge, "that must be in the minds of all utility executives in the United States. New business? Yes, if we want to make the effort to get it and if we want to pay the price for it. But suppose we do get this new business and add it to our lines, in the hope that it will some day prove profitable. And when we get the business all built up the government may come along and take it and our properties away from us.

"I do not think that we can dismiss the possibility of government ownership, preceded by destructive competition, as any idle threat. It is a very real danger and one that we cannot afford to minimize. But we can't afford to magnify it either, because if we do we shall inevitably be stopped, not only from effort to develop the commercial side of our business, but also from even the necessary activities to keep it operating.

"Then suppose we do abandon all hope of a future for our industry in the fear that we shall lose it; what, then, if the trend in government changes its direction? This is a hope not entirely unjustified. As a matter of fact, the trend can be changed just as quickly as it was started. So, all things considered, it seems to me that the intelligent utility man will turn himself to load building with an enthusiasm that can be none the less effective from being controlled.

Going ahead with aggressive sales

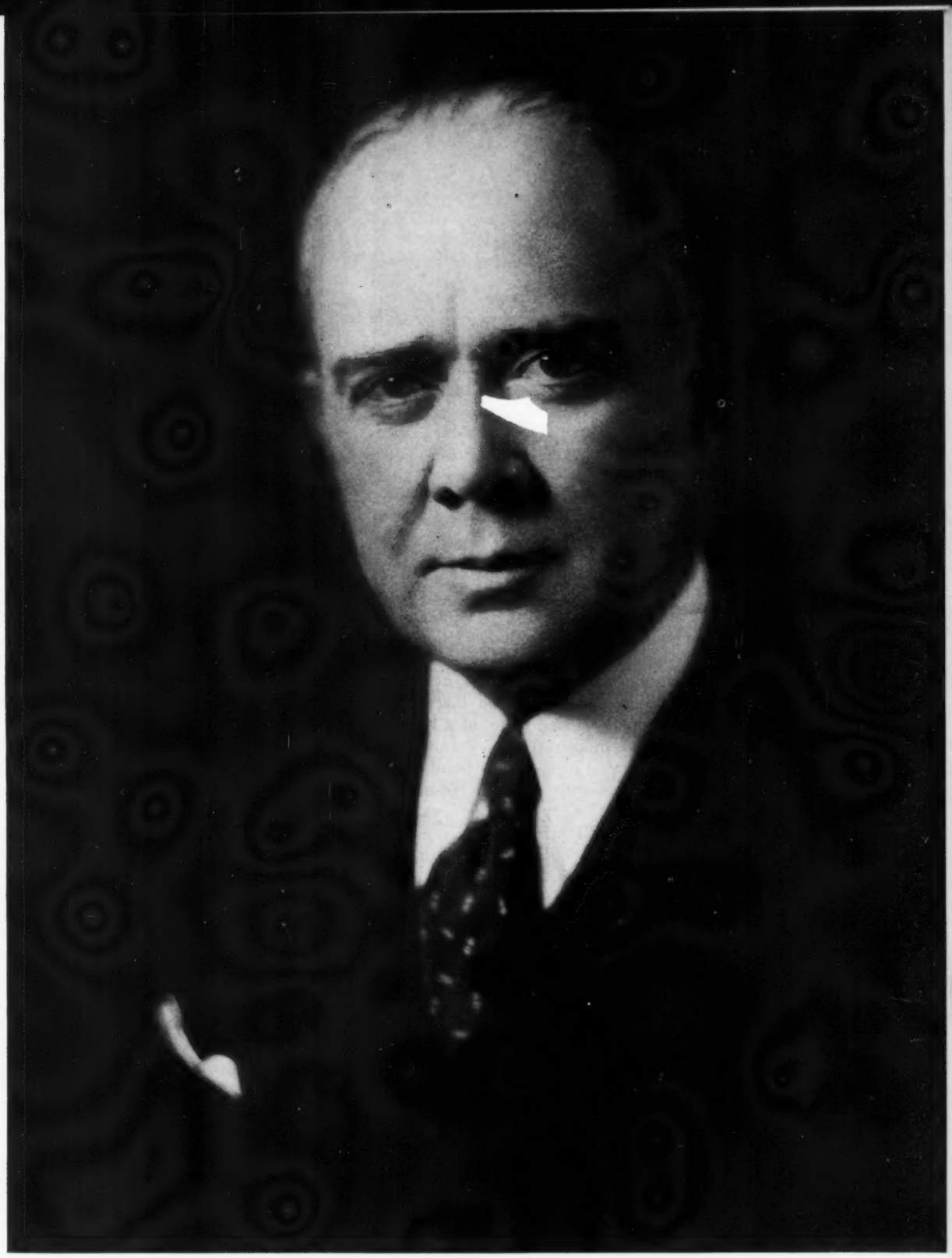
"In our group we are going ahead with aggressive plans to put ranges, water heaters, refrigerators and all manner of electric appliances into the American home. But we are studying what it costs to put each one of these appliances into service under the particular conditions of the local utility. We must know what our load development costs are. It is not enough that we have an accounting figure of merchandise losses to be charged to promotional expense. We have got to know what it has cost us in actual selling expense and additional capital investment to put that range, that refrigerator, that water heater into service. And having determined that cost, we are going to be neither proud of it nor afraid of it.

"The criterion of the cost of load development is not stated in terms of cents per dollar of estimated annual revenue from new load nor as a percentage of gross revenue. It may very easily be possible for one company to spend $2 to put an estimated annual revenue of $1 from a certain kind of appliance on its line and show a profit on the operation, while another company spending only 50 cents to put the same dollar of revenue from the same appliance on its line may show a loss. There is thus no standard of cost of new business that can be applicable to all properties. Each case must stand on its own feet. And the real answer as to whether a company is spending too little or too much for load building is in the net return it has available for equity earnings after all operating and fixed charges have been paid.

"There are fundamental requirements necessary before putting this idea into practice, but in general it stands as stated. If that rule is adhered to the only thing that can harm a soundly organized and operated business is a force from outside such as threatens the utilities today. But a man does not stop living because he is afraid he will be killed, and by the same token the owners and operators of a business cannot give up all effort toward growth and expansion because they fear the business may be taken away from them.

"When a business stops growing it begins to die. So we've got to keep on growing, no matter what clouds gather over our heads, which is another way of saying that if our problems can be solved at all, it will be by doing our job to the best of our ability and fighting for our rights as American citizens."

Thus, while having no panacea for industry salvation, Mr. Hodge points the way to action.



WILLIAM H. HODGE, who has just completed 25 years of service with the Byllesby Engineering & Management Corporation, is a former newspaper man. Mr. Hodge has been a close observer of the industry and has aided greatly in developing the business. He is now serving as chairman of the range sales promotion committee of the E.E.I. and talks about sales.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

PUBLISHED EVERY OTHER SATURDAY BY McGRAW-HILL PUBLISHING COMPANY, INC.

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The Chamber Speaks Out

• Business went to Washington last week. It called for a showdown on recovery and reform. The Chamber of Commerce demanded that the Administration show its hand. It said bluntly that business could not go ahead while the Administration tried to destroy wealth and wipe out private enterprise. It said that reform should wait upon recovery. It said there must be some permanent financial and industrial policy announced by the Administration instead of the inconsistent experimental policies that incessantly emanate from lieutenants and bureaucrats. The cry was "give us peace and permanency and we will bring about recovery." Forney Johnston and Wendell Willkie brought the utilities forward as a horrid example. They told the utility story and got the support of business against the destructive legislative proposals of the Administration. A sweeping condemnation and a critical analysis of administrative acts was followed by resolutions that laid down definite demands. Business adopted an aggressive, no-quarter, pro-business policy. The scene has changed.

New Impetus to Power Sales

• A revival of industrial business gives an opportunity for action to moribund power sales departments. Too frequently this department has been neglected and skeletonized during the depression. Conditions have changed. Industry is getting busy. Power salesmen have an opportuntiy. But they must be competent. They must know the industries served and the new equipment available. Use of the factory check sheets by Public Service of New Jersey and other properties has been found useful. Use of the flow sheet analysis method by West Penn has been effective. There are new methods and new tools. Power salesmen will be called upon as consultants when industrials go into the electrical market. They should be competent. They should show industrials that they should buy as well as what to buy.

Now Is the Time for Commercial Selling

• Spring is here and summer approaches. This is the season for sales in all classes of business and especially in commercial business. Air conditioning goes best in summer, when people wish to be cool. Store and sign lighting is most effective because people stir about on warm summer nights. Restaurants, hotels and bakeries are receptive to commercial electric cooking and water heating through well-insulated equipment. The psychology is right to get people to change, to do things that have been put off. Many properties are busy at commercial business and find it can be had at a rate comparable to domestic business.

Commercial Meeting Indicative

• At the recent sales conference in Chicago there was an attendance of nearly 300 men. This was a surprise and is indicative of what to expect at industry conventions this spring. There is need for mingling together and a swapping of ideas and experiences. Business is better, plans are being made. A new spirit and attitude prevail. We venture to predict unexpectedly large attendances at all electrical meetings and programs replete with valuable information and ideas.

Industrials Are Awakening

• News of money spent by steel companies for remodeled plants shows that industry is awakening. It is getting business and it finds that it must modernize. Behind the dollars spent in steel plants is the fact that a modern electrical mill turned out a better and cheaper product. When one company acted they all had to act. This is true of other industries. Surveys and news of plans in industry show that from 30 to 50 per cent of the industrial plants will be in the market for electrical products this year. Let's pick out the bellwether in each group and fit it out with the best and most economical electrical installation. The others will have to follow the leader.

Distribution Men Active

• We are glad to see the E.E.I. distribution committee busy with the production of articles that give new ideas on distribution. Now is the time to get acquainted with the new devices and the improved devices brought out by the manufacturers during the depression. From substation to service there are new things and better things. These articles will show how to use them best. Our E.E.I. issue will show the new and improved devices. Pouring on the loads call for revamped distribution to give better service and better regulation. We are fortunate in having the equipment available to do this economically.

Recovery Issue Aids the Industry

THE March 30 Recovery Issue of ELECTRICAL WORLD had a splendid reception and a constructive effect. Hundreds of letters and comments were received and they continue to arrive. Requests for copies of the issue are still coming in from all sections of the country. It was and still is a topic for conversation and discussion at conferences of all groups interested in the electrical industry. Columns of newspaper space treated the issue and the data constructively and many editorials were written with it as a base for opinion and comment.

Of particular interest were the letters from public officials. Outstanding in this connection was the fact that the data were welcome and were useful. No negative letters were received. No tirades came in against the industry or the issue.

Many U. S. Senators acknowledged receipt of the issue and commented upon it. The replies were sometimes definite and sometimes indefinite, but all were gracious and indicated interest. Senator Capper wrote: "It contains information that is most convincing and will be very helpful to Congress and others interested in public affairs. There is no doubt many of the utilities have done good work and are entitled to fair consideration so far as the legislative program is concerned." Some of the other Senators thanking us for the issue and stating that they read it with interest were Maloney, Reynolds, Pope, Wheeler, Tydings, Couzens, Hale, Bone, Thomas, Buckley, Bailey, Bachman and Sheppard.

A large number of representatives in Congress acknowledged the issue, promised to read it carefully or commented upon its value and usefulness. A sample comment is from Mr. O'Neal: "I read it with much pleasure and profit. I was very glad to have the information relative to holding companies, and I feel that the facts should be given to every member of Congress." Mr. McClellan said: "I find it very instructive and have placed it in my permanent files for future reference." Other members of the House who wrote were McCormack, Buckbee, Duffy, Hope, Eckert, Bell, Jones, Wearin, Shanley, Tinkham, Ransley, Byrns, Hobbs, Wilson, Millard, Crosby, Rogers, Robertson, Cochran, Healey, Carmichael, Clark, Gilchrist, Dunn, Steagall, Mitchell, Crowe, Gray, Stewart, Short, Starns and Thompson.

These men are interested in the utility situation. They welcomed information and data. They gave the impression that they wanted to be fair and that they wanted the facts about the industry.

IN ADDITION to these letters from Washington, there were appreciative letters from members of the Cabinet, from the Interstate Commerce Commission, the Federal Power Commission, the War Department and other governmental agencies. Without commitments as to opinion, these officials said they were glad to have the issue, appreciated the data and read it.

An astonishing number of the Governors of the several states wrote in to thank us for the issue and to express their opinion of the usefulness and value of the data. A cross-section shows McNutt of Indiana, Moeur of Arizona, La Follette of Wisconsin, Merriam of California, Cochran of Nebraska, Landon of Kansas, White of Nevada, Graves of Alabama, Martin of Oregon, Hoffman of New Jersey, Tingley of New Mexico, Lehman of New York, McAllister of Tennessee, Ross of Idaho and Scholtz of Florida. These letters were not form replies, signed by secretaries, but dictated letters signed by the Governors in nearly all cases. To us they indicate that the Governors are trying to grasp the facts about the utility business and appreciated the data.

This issue was in great demand and created a great deal of comment and discussion in business and financial circles. Many reports of conferences and conversations about it came to us from all sections in these groups and hundreds of requests came for extra copies from these men. A typical section shows the New York Life Insurance Company, Pacific Mutual Life Insurance Company, Chase National Bank, Atlas Corporation, U. S. National Bank of Portland, Richard Whitney of the New York Stock Exchange, Evans, Stillman & Company, the Federal Reserve, Philadelphia Savings Fund Society, the McLain Organization and R. E. Lovekin Corporation. These business and financial executives are interested in the utility business.

MANY newspaper editors wrote to thank us for the issue and hundreds of columns of news and editorial comment were printed in papers in all sections of the country. The comments on the whole were constructive and factual and indicated that the press appreciates and will use facts about the business.

Naturally enough, hundreds of congratulatory comments were received from enterprises in the electrical industry. Especially notable were those from electrical manufacturers, who have recently come to bat for the utilities in great shape, both in this issue and in the Rayburn hearings in Washington. Many utilities and manufacturers bought extra copies of the issue for distribution.

What does all this mean? As nearly as we can measure results they are these:

1. Legislators and public officials read and were glad to get the issue. The facts presented are certain to have an influence upon their thought and action.

2. Newspaper publicity and comment was not only constructive in aiding the public to understand the utility situation; it also proved that these newspapers would use facts and that they were not anti-utility.

3. General business and financial enterprises liked the issue for the information presented and it undoubtedly served to bring their influence to bear to get fair play for the industry.

4. It was a morale builder for the industry. It brought unity, purpose and a new spirit into play. It gave encouragement. It put into print information, data and opinions that all could support.

The evidence shows that the Recovery Issue was constructive and effective. It will continue to win support for the industry in its endeavors to go forward and to get fair treatment.

NEWS OF THE INDUSTRY

Morris Cooke Directs Rural Electric Plan

Appointed by President Roosevelt to head rural electrification division of works-relief program — Submits report embodying ideas on the subject

In a concise report that has already been read by President Roosevelt and most of his Cabinet, Morris L. Cooke has expounded his ideas of what a program of rural electrification can and should contribute to any schedule of public works. Appointed last week to head this division of the works-relief program, he will have the opportunity to make a practical demonstration.

Without closing the door to co-operation with private utilities, this document indicates that public power sources, such as the government plants in the Tennessee Valley, at Boulder Dam, Grand Coulee, Bonneville, Fort Peck and elsewhere, would be used extensively. Thus, inferentially at least, rural electrification on a $100,000,000 scale would become a major step in an eventual national control of the generation, transmission and distribution of electricity.

Ten customers to the mile

Sufficiently accurate for general public consumption, the figures of 100,000 miles of rural transmission lines to serve a million farms imply an average of ten customers to the mile—high even for dirt farms. Actually, a strictly rural line won't average much more than 2½ customers per mile; must add towns and villages to its service to achieve an even halfway satisfactory operating ratio.

That the number of electrified farms will practically double under the present program is entirely credible. Equally imminent is the possibility of a marked change in who will pay the bill for rural transmission line construction. With the government actively in the field, the utilities will have to follow suit in transferring to themselves the cost of construction of such main feeder lines, or see the power load, such as it is, go to public operators.

In spending the $100,000,000, line construction through new territory will probably be considerably cheapened from private utility standards—with present costs of $1,000 to $3,000 a mile sharply clipped in an effort to extend the service as widely as possible through the farming areas.

Mr. Cooke has declared that public works will have a constantly increasing importance in the social set-up that may be expected to follow the current political and economic experimentation. He has indicated in a recent address before the American Water Works Association that in his opinion public works appropriations must include sufficient items to master completely all of the country's water problems and related activities—flood, erosion and low-water control, navigation, irrigation, forestry, and far-flung rural electrification. He has said most emphatically that any rural electrification program must be organized along lines that will provide ample power for water pumping in those areas where a defense must be set up against the creeping paralysis of soil erosion.

President Roosevelt's Advisory Committee on Allotments in its first meeting this week at the White House segregated $2,000,000,000, half of the appropriation, for the various projects designated in the works-relief act. The sums were set aside for immediate expenditure. Rural electrification was allotted $50,000,000.

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City and Government Take Consolidated Rate Cut

Offer of the Consolidated Gas Company and its subsidiaries for a reduction ranging up to 35 per cent in municipal and federal power rates in New York City was accepted this week by the government and the city, Secretary Morgenthau and Mayor LaGuardia announced after a conference at the Treasury in Washington. Contracts with New York City, retroactive to January 1, will cover the calendar year 1935, and those of the government, retroactive to July 1, 1934, will be in force during the fiscal years 1935 and 1936. Government contracts with two Westchester subsidiaries were for the fiscal year 1936 alone. The city will save $2,400,000 and the government approximately $200,000 annually.

Mayor LaGuardia indicated that he will now take steps to get a reduction in rates for private consumers. Mr. Morgenthau said that the signing of contracts would have no effect one way or the other on the construction of municipal and federal power plants in New York with federal funds, but made clear that no such step was contemplated immediately, remarking that the chances are the P.W.A. money allotted will be returned.

Chamber of Commerce Hits Utility Bill

In resolution adopted at annual meeting opposed federal regulation of operating companies — Willkie scores utility attacks — E. W. Allen, General Electric vice-president, addresses power group

Sharp criticism of New Deal measures and demands for clarification of national economic policy were voiced at the annual meeting of the Chamber of Commerce of the United States held April 29 to May 2 in Washington, D. C. Industrial, financial and legal authorities called upon the government to take the government out of business as soon as possible and suggested drastic modification of the utility, banking, labor and NRA bills.

Power group commended

At the sessions on the subject of power and constructive utilization of natural resources, discussion centered chiefly on the rôle government can properly play in the regulation and stabilization of industries in this field. A prediction that the persistent attacks upon public utility holding companies, the enactment of the holding companies' bill and government competition in the power field will lead to disaster was made by Wendell L. Willkie, president of the Commonwealth & Southern Corporation. E. W. Allen, vice-president of the General Electric Company, commending the power production group for their readiness to attempt new things, pointed out that water-power development must always supplement, rather than displace, fuel generation. The electrical industry, he said, has been built around the fuel-burning plant. He predicted that the greatest future demand for electricity would arise out of its use for heating rather than lighting. Reliability, standardization, improvement of fuel-burning plants and the gradual lowering of rates he cited as the outstanding accomplishments of intelligent co-operative management.

Included in the resolutions adopted by the chamber as a business program was one entitled "Utility Bill of 1935." It read in part: "To the regulation of public utilities the chamber has long been committed. . . . The utility bill of 1935, as introduced in Congress, not only would seek to superimpose federal regulation upon state regulation of operating utilities, but would undertake to destroy

utility holding companies, which have had a substantial part in the development of our electric and gas utilities and which have undoubtedly conferred upon large areas benefits which they otherwise would have lacked. The growth of American utility enterprises has in some cases been accompanied by abuses. It is in the public interest that all such abuses should be prevented. . . . Other abuses should be definitely identified in legislation and such provision for regulation should be made as the public interest requires. . . . . All attempts to superimpose federal regulation of operating companies upon state regulation should be abandoned. The effects can only be detrimental to the interests of the communities which are served. . . . "

Harper Sibley, Rochester, N. Y., banker, was elected president to succeed Henry I. Harriman.

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Massachusetts Rate Report Issued by Commission

Following up its first report covering electric residential rates in cities of 50,000 or more population (ELECTRICAL WORLD, February 2, page 43), the Federal Power Commission began last week to release detailed data on the individual states. Massachusetts was the first covered. Similar reports are being prepared for each state in the Union.

Banking and Insurance Interests Oppose Wheeler-Rayburn Bill

At Senate hearings James Loomis testifies for some twenty insurance companies — Mutual Savings Banks Association official takes issue with measure — Roosevelt calls legislation recovery measure

As the hearings on the Wheeler-Rayburn bill before the interstate commerce committee of the Senate came to a conclusion on Monday, April 29, it was evident that relegation of holding companies to the status of investment trusts remained the idea uppermost in the minds of many of the Senators. Much of the cross-examination of the utility witnesses appeared inspired with this view.

Denying unequivocally any change whatever in his point of view as several times previously expressed in the columns of ELECTRICAL WORLD, nor any modification in his condemnation of such abuses as have admittedly been perpetrated in some cases by some holding companies, Board Chairman Samuel Ferguson of the Hartford Electric Light Company and of the Connecticut Power Company told the committee that in his opinion a literal interpretation of Title I of the bill would include as a holding company his own operating companies, publicly praised though they have been by government witnesses as models to be followed in reorganizing the utility industry. This was so, he asserted, since his companies, by maintaining an interconnection with an out-of-state utility, are not "exclusively intrastate in character."

To his own list of recommendations for the modification of the bill, Mr. Ferguson added his support of the suggestion of Dr. Walter M. W. Splawn that tax provisions which might stand in the way of a prompt simplification of corporate structures be suspended.

Representing some 23 insurance companies of Hartford, Conn., President James Loomis of the Connecticut Mutual Life Insurance Company testified that the effect of the proposed holding company legislation would be to immediately, and perhaps definitely, dry up one of the most important and satisfactory outlets for the further investment of institutional trust funds; would cause a serious shrinkage in the market value of substantially all public utility securities, and would result in a steadily diminishing margin of safety of net earnings and of property values represented in bonds and stocks now owned and held for investment by insurance companies.

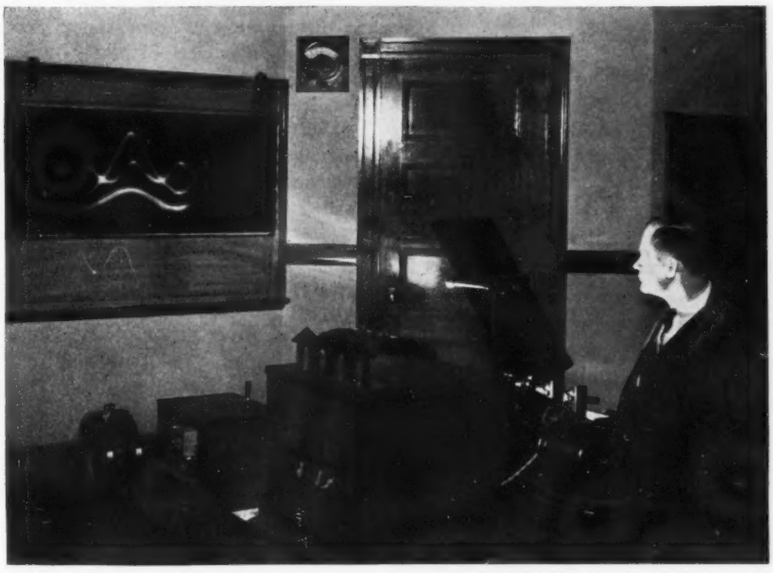
Repeating much of the testimony he gave before the House committee, President Wendell L. Willkie of the Commonwealth & Southern Corporation pleaded for consideration of legislation more in line with the suggestions he had offered several weeks ago. Vice-President Edmund W. Wakelee of the Public Service Corporation of New Jersey proposed an amendment which would exempt from the scope of the bill such holding companies and subsidiaries as had their capital assets and charters under a single state and whose interconnections with out-of-state utilities represented a very negligible transfer of energy.

Banker files objections

Represented by Fred N. Oliver, its counsel, the National Association of Mutual Savings Banks took issue with two provisions in the bill which, in its opinion, would impair the integrity of the underlying obligations of the utilities. These provisions were, first, compelling any operating company to act as a common carrier and transmit electrical energy over its own lines for other companies, and, second, dismembering existing systems to regroup them along regional lines.

Former Kansas Governor Clyde M.

OSCILLOGRAPH APPARATUS IMPROVED



To escape the limitations of the conventional types of oscillograph with respect to their simultaneous scrutiny by an audience, Prof. Hobart H. Newell of the electrical engineering department, Worcester Polytechnic Institute, has developed a reflecting type of instrument which projects a 3-ft. wave image on a blackboard or screen. A large group can now observe the current and voltage wave forms and changes with ease as conditions are varied. While the instrument was constructed primarily for classroom work at the institute, its use with metermen's schools and in other ways suggests a much wider field of utility

Reed, appearing on behalf of two Kansas organizations of investors, emphatically reiterated his stand outlined in testimony before the House committee and insisted that unless some changes were made in the bill as at present written it would very severely interfere with and embarrass state regulation. He was vigorously supported in his conclusions by H. Lester Hooker and John E. Benton of the National Association of Railroad and Utilities Commissioners.

The Senate committee this week defeated by a vote of 11 to 3 an attempt to cancel the provision for abolishing holding companies in the public utility field. The committee, however, decided to postpone by two years the date by which holding companies must go out of business, advancing the time from 1940 to 1942.

President's radio plea for bill

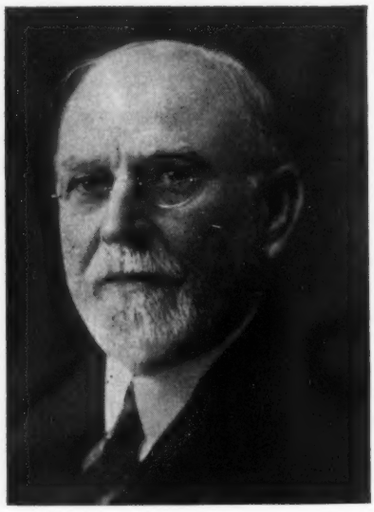
Commenting on the holding company legislation now pending, President Roosevelt in his radio address last week said: "There is pending before the Congress legislation to provide for the elimination of unnecessary holding companies in the public utility field. I consider this legislation a positive recovery measure. Power production in this country is virtually back to the 1929 peak. The operating companies in the gas and electric utility field are, by and large, in good condition. But under holding company domination the utility industry has long been hopelessly at war within itself and with public sentiment. By far the greater part of the general decline in utility securities had occurred before I was inaugurated. The absentee management of unnecessary holding company control has lost touch with and has lost the sympathy of the communities it pretends to serve. Even more significantly, it has given the country as a whole an uneasy apprehension of overconcentrated economic power in the hands of a very few.

"A business that loses the confidence of its customers and the good will of the public cannot long continue to be a good risk for the investor. This legislation will serve the investor by ending the conditions which have caused that lack of confidence and good will. It will put the public utility operating industry on a sound basis for the future, both in its public relations and in its internal relations.

"This legislation will not only in the long run result in providing lower electric and gas rates to the consumer but it will protect the actual value and earning power of properties now owned by thousands of investors who have little protection under the old laws against what used to be called frenzied finance. And remember that it will not destroy legitimate value."

Honor J. H. McGraw

Publishers give testimonial dinner — Fifty years of leadership in business publishing — Publishing an intimate part of business.



A feature of the spring meeting of the Associated Business Papers at Hot Springs last week was a testimonial dinner to James H. McGraw. This dinner was in appreciation of the completion of 50 years of leadership and service in business paper publishing. A gold wrist watch and a scroll signed by all present were presented to Mr. McGraw.

C. J. Stark presided at the dinner on Saturday night and several speakers spoke about the achievements of Mr. McGraw. Merton Robbins, Paul Aldrich, Arthur Anderson, E. R. Shaw and Malcolm Muir spoke of his ideals, his vigor and his insistence upon high standards and a place for business publishing, his stress upon editorial quality and standards and his leadership in developing the the business press.

Mr. McGraw responds to tributes

In his response Mr. McGraw spoke of the contrast between the business press of 50 years ago and today. In those days both the business press and trade associations were in their infancy. He pointed out that standards had been raised steadily in business publishing and that it had now become an intimate and essential part of business. Today the problem of business publishing is to establish leadership in industry, to point the direction which business should take and help convert individual thinking into a desirable group trend. Not only editorial standards have changed. Today advertising is a business with research, market analysis and an intimate knowledge of industry as necessary to success.

In his address Mr. McGraw outlined the publishing philosophy he has developed in 50 years of experience. "In my opinion," he said, "the function of the business paper is to advance the status of the industry it serves and to supply the individual members with a specific knowledge concerning the industry. The first represents a new function, one which has become necessary within the last fifteen years. In fulfilling the new function, which is really a leadership job, the business paper requires a new relationship to its field. It becomes both a protagonist and a constructive critic of the industry. A business paper of today, in my opinion, has a greater opportunity for constructive, positive leadership than ever before."

He also stated that there is another new and vital function of the business paper. This is "to keep its readers informed as to the effect of the broader economic forces on their own business and to interpret these as well as political and governmental action as it affects their business." In the opinion of Mr. McGraw the path to success for industry today is through the medium of its industrial papers and industrial advertising.

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Southeastern Group Holds Conference

Broad program covered at second annual meeting of Southeastern Electric Exchange — Spirited discussions a feature — J. G. Holtzclaw elected president

With practically all of the companies in the territory in attendance, the second annual conference of the Southeastern Electric Exchange was held at Augusta, Ga., recently.

Delivering the opening address, President J. M. Barry reviewed the accomplishments of the exchange during the past year and stressed the future importance of this organization to the industry in the Southeast.

The two-day program included the following papers and addresses: "The Objective Rate Plan," by Frank A. Newton, Commonwealth & Southern Corporation; "Merchandising of Electrical Appliances," by Mr. Ashmead; "Developing the Lighting Load," by Roy A. Palmer, Southern Public Utilities Company. E. C. Easter, Alabama Power Company, spoke on rural electrification and J. K. Knighten, Kelvinator Corporation, discussed the future of air conditioning to utility companies. Discussions followed the presentation of each paper.

One of the outstanding features of the meeting was the address by Preston S. Arkwright, president Georgia Power Company, before the annual banquet.

J. G. Holtzclaw, president of the Virginia Electric & Power Company, was elected president.

E. E. I. Discusses Sales Problems

Valuable results of research among customers revealed at sales conference of Edison Electric Institute — Financing appliance sales, rural electrification, air conditioning vital topics considered

Financing appliance purchases, research among customers to determine sales methods, dealer co-operation, small appliances, rural electrification, air conditioning, these were the subjects to which was devoted the first day of the Edison Electric Institute annual sales conference held recently in Chicago. E. W. Lloyd, Commonwealth Edison Company, made the address of welcome to the delegates.

That low rates are not alone the cause of large domestic use of electricity was maintained in the paper by P. H. Powers, West Penn Power Company, entitled "Lessons Learned through Research Among Our Customers." The object of this research, which included four complete customer surveys since 1928, was to discover if possible why, regardless of the rate, the average domestic annual bill appeared to strike a barrier that prevented it going higher than about $30. The data secured by these surveys have been used in many departments of the company other than the sales and have demonstrated their value over and over again. In selling, the survey information has been used to determine sales methods as applied to various classes of customers and has been very useful to indicate where and how specific sales items should be pushed most profitably.

Financing facilities urged

That consumers to the extent of their needs should have financing facilities equivalent to those available to producers was the theme expounded by M. E. Skinner, Niagara Hudson Power Corporation, and the opportunities for financing under the Federal Housing Administration were explained by George G. Mead of that body. In answering the questions: "Does Dealer Co-operation Work?" and "Does It Profit?" H. M. Crawford, Pacific Gas & Electric Company, related the experience of his company in getting along with dealers for many years. The formula, said Mr. Crawford, is for the utility to bend its sales efforts toward load building and to leave to the dealers the distribution of appliances that have become established as retail merchandise.

Another question was asked on the program: "Is the small appliance market of value to the utility?" And to it, as scheduled, C. E. Swartzbaugh stated a strong affirmative. The confusion attendant upon the so loudly ballyhooed government promotion of rural electrification and the efforts of the utilities to clarify the situation and to open political eyes to the magnitude of the job were set forth by Hudson W. Reed, United Gas Improvement Company. Mr. Reed urged the utilities to do everything possible to keep government out of this field because inevitably waste and harm will result.

Cooking campaign sponsored

A national advertising campaign for electric cooking has been sponsored by Edison General Electric Appliance, Westinghouse and General Electric companies, stated W. H. Hodge, Byllesby Engineering & Management Corporation. Last year 123,000 ranges were sold and in January, 1935, shipments were 83 per cent above the similar period in 1934.

Results of the objective rate plan were told by F. A. Newton and E. W. Ashmead gave a report on the merchandising activities of the Tennessee Electric Power Company. Electric kitchens, lighting and other topics were presented and discussed.

Meeting in the long corridor of the Edgewater Beach Hotel in Chicago at the recent E.E.I. sales meeting, this group of power salesmen discuss informally their various problems. They are, left to right, D. H. Gerhard, Consumers Power Company; H. C. Webb, Jr., Virginia Electric & Power Company; Francis McQuillin, West Penn Power Company, and C. H. Purdy, Consumers Power Company

An interesting meeting of the industrial power and heating committee was held. Power interchange contracts with industrials, the development of new industrial business and the technique now required in power sales were discussed. Several new processes for industry were mentioned. Reports on industrial heating were discussed also. Isolated plant competition was reported as decreasing and power business in industry as improving.

•

Parker Dam Project Halted; U. S. Court Upholds Arizona

Construction work on the Parker Dam was halted last week by Dr. Elwood Mead, Commissioner of Reclamation, after the United States Supreme Court refused to restrain Arizona from interfering with its construction. The court denied the permanent injunction asked by the United States. State guardsmen were called out and martial law was declared last November to halt the work which began on the Colorado River near Boulder Dam in September (ELECTRICAL WORLD, November 24, page 46).

What effect the Parker Dam ruling will have on other major power developments was the subject of lengthy discussion. It was recalled that the same procedure as that used for this project had been followed in approving and allotting money for construction of the Grand Coulee Dam in Washington, the Bonneville Dam in Oregon, the Fort Peck Reservoir at the headquarters of the Missouri in Montana and for some upper Mississippi River works.

•

Government Files Suit in New River Case

Action has been filed by the Department of Justice in the federal district court at Roanoke, Va., to support the authority of the Federal Power Commission and the constitutionality of the federal water-power act. It named the Appalachian Electric Power Company and demanded the company obtain a federal license for its $10,000,000 dam and power project on the New River, near Radford, Va. This action was taken by the Department of Justice at the request of the Federal Power Commission (ELECTRICAL WORLD, March 30, page 124).

•

Paris Meeting Dates Changed

Dates for the International Conference on Large High-Tension Electric Systems have been definitely set for June 27 to July 6. A previous announcement had provided for June 6-15. One hundred and fifty-two papers, dealing with electrotechnical matters, will be read at the sessions to be held in Paris.

T.V.A. Act Revision Asked; Court Restrains Line

Request has been made by Representative Pettengill of Indiana that the House military affairs committee reopen public hearings on the proposed amendments to the Tennessee Valley Authority act to receive recommendations that the law be revised to permit states and municipalities to tax government power projects, such as the T.V.A. Mr. Pettengill's request was made after it became apparent that his plan to tax the T.V.A. would not be received as a germane amendment to the Wheeler-Rayburn utility bill, pending before the interstate and foreign commerce committee, of which he is a member.

Petition of the Tennessee Valley Authority to construct an 18-mile transmission line in Colbert County, Alabama, was denied April 26 by Judge W. I. Grubb in U. S. District Court in Birmingham. In denying the petition Judge Grubb held that it involved the same question in his ruling last March in which he granted an injunction to restrain the T.V.A. from purchasing certain property from the Alabama Power Company and engaging in business as a utility. Judge Grubb granted another petition, however, giving the authority the right to construct a one-mile line in Lauderdale County connecting with Wilson Dam, eliminating the necessity for interchange of power with the Alabama Power Company.

•

Court Sets Insull Trial; Commonwealth to Refund

The trial of Samuel Insull and eight others charged with violation of the bankruptcy law has been set for June 4 before Judge James H. Wilkerson in federal court in Chicago. Mr. Insull's bond of $200,000 was recently reduced to $10,000 by Judge Wilkerson after District Attorney Dwight H. Green said he would not oppose the reduction. Attorney-General Homer S. Cummings stated that the Department of Justice had asked the State Department to proceed with extradition from Canada of Martin Insull, wanted at Chicago for trial with his brother and associates.

Hearings on the proposed reorganization of the Middle West Utilities Company under a plan presented by secured creditors and agreed to by noteholders, a majority of preferred-stock holders and a substantial number of common-stock holders have been adjourned until June 3. In the meantime proceedings by which the company was placed in receivership were upheld when the United States Supreme Court refused to review the decision of lower federal courts in Illinois. The high court dismissed a suit brought by Sidney B. Pollak, a stockholder, to have the receivership proceedings set aside on the ground that Samuel Insull had resorted to fraudulent and collusive methods in obtaining the appointment of receivers.

Commonwealth Edison Company has mailed notices of a special meeting of stockholders on May 25 to authorize the directors to proceed with the proposed refunding of $17,500,000 of 5½ per cent series G bonds and $12,000,000 of 4½ per cent E bonds.

•

Fraud and Mismanagement Charged to Clarke Utility

Details of the affairs of the Public Utilities Securities Corporation, finance company in which virtual control of the Utilities Power & Light Corporation was vested, have been set forth in an affidavit filed in Wilmington, Del., by Norman C. Norman, holder of 100 preferred shares of the company. According to the brief, they indicate that the company has been mismanaged and its assets wasted and that void and fraudulent liabilities have been created against the company. Mr. Norman claims that no annual or other statements have been issued by the Public Utilities Securities Corporation in more than two years, and the void and fraudulent liabilities were created in that period.

The annual meeting of the Utilities Power & Light Corporation will be held June 26 in Richmond, Va., having been postponed from April 24.

COMING MEETINGS

National Electrical Manufacturers Association — Spring meeting, The Homestead, Hot Springs, Va., May 20-23. W. J. Donald, 155 East 44th Street, New York.

National Society of Air Conditioning Engineers—Annual convention, Merchandise Mart, Chicago, Ill., May 20-25.

Edison Electric Institute—Atlantic City, N. J., June 3-6. B. F. Weadock, 420 Lexington Avenue, New York.

Public Utilities Advertising Association—Annual convention, Chicago, June 9-12. Clayton G. Cassidy, Peoples Gas Light & Coke Company, 122 South Michigan Avenue, Chicago, Ill.

American Society of Mechanical Engineers—Semi-annual meeting, Cincinnati, Ohio, June 19-21. C. E. Davies, 29 West 39th Street, New York.

American Institute of Electrical Engineers — Summer convention, Ithaca, N. Y., June 24-28. H. H. Henline, national secretary, 33 West 39th Street, New York.

American Society for Testing Materials—Annual meeting, Book-Cadillac Hotel, Detroit, Mich., June 24-28. R. E. Hess, assistant secretary, 260 South Broad Street, Philadelphia, Pa.

Canadian Electrical Association — Annual meeting, Algonquin Hotel, St. Andrews-by-the-Sea, N. B., June 26-28. B. C. Fairchild, secretary, 409 Power Building, Montreal, Que.

Bankers Favor Utilities at New York Meeting

At the annual meeting of the National Association of Mutual Savings Banks in New York May 8 a session was devoted to public utilities. E. K. Woodworth, chairman of the committee on public utility securities, reported for the committee. It took action to oppose the Wheeler-Rayburn bill at the hearings in Washington and its annual report definitely opposed this bill as written. "We believe there is grave danger in legislation," he said, "which fails to recognize, as does this bill and the report upon which Title I is founded, the economic value and importance of the holding company and which is drafted on the theory that elimination rather than regulation and control is the remedy. . . The adoption of Title II as it now stands would result in federal rather than local regulation and would mean the complete nationalization of the industry." This committee reported $700,000,000 of public utility bonds held by savings banks, of which 80 per cent are in electric and gas companies.

Thomas N. McCarter, president of the Edison Electric Institute, discussed the present utility situation. He said that in his opinion the President had an "obsession" on the subject that even some of his closest supporters in Washington do not understand. He gave his opinion that the Wheeler-Rayburn bill would not pass without modification. "The Wheeler-Rayburn bill must be defeated," said Mr. McCarter.

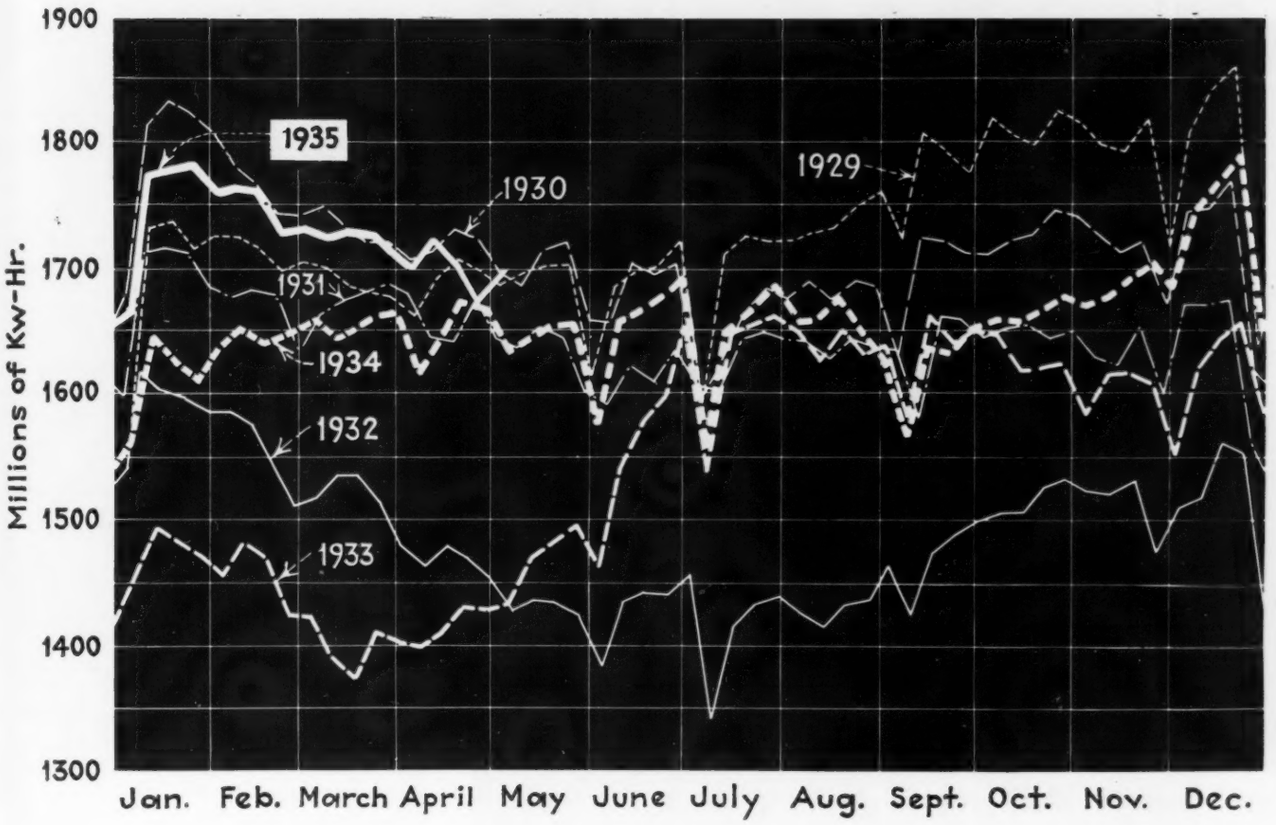
The value of utility securities will be seriously impaired if the government continues "injuring private utilities by subsidized competition, discriminatory taxation and punitive legislation," said L. W. W. Morrow, editor of ELECTRICAL WORLD, in his address. He pointed out the improved business conditions in the industry, the possibilities for expansion and the new spirit with which the utilities were now going after business. He stressed the need of fair play in Washington.

•

Comet Hits 110-Mile Speed

Making its first test run on April 29 from New Haven to Boston with an official inspection party aboard, the *Comet*, new light-weight, streamlined train of the New York, New Haven & Hartford Railroad, broke railroad speed records for New England when it hit 110.5 miles an hour over a one-mile stretch near Kingston, R. I. It covered 156.8 miles in 143 minutes, averaging 65.8 miles an hour. Westinghouse-equipped, this three-car all-aluminum train, with a 400-hp. Diesel at each end, accommodates 160 passengers. Fourteen tons of cooling for air conditioning and indirect lighting giving 7 foot-candles at reading height are features.

Output Regains Parity With 1930



Making an upward turn after the moderate decline of the two preceding weeks, central station energy output for the week ended May 4 regained equality with that of 1930, the record year. It amounted to 1,698,178,000 kw.-hr., according to the Edison Electric Institute. This was 4 per cent more than last year, and therefore somewhat above the average gain during March and April.

Recently the excess over 1934, which earlier in the year had been as large as 10 per cent, had shrunk to 0.3 per cent and production dropped 3 per cent under 1930. In comparison with both of these the new figure shows an improvement. The usual seasonal decline is of course in evidence but production last week was only 4.3 per cent less than the highest in January, whereas the corresponding decrease in 1930 was 7.4 per cent.

All regions except the Pacific report greater production than last year and greater relative gains than in the final week of April.

Weekly Output, Millions of Kw.-Hr.

1935	1934	1933
May 4...1,698	May 5...1,633	May 6...1,436
Apr. 27...1,673	Apr. 28...1,669	Apr. 29...1,428
Apr. 20...1,702	Apr. 21...1,673	Apr. 22...1,431
Apr. 13...1,725	Apr. 14...1,642	Apr. 15...1,410
Apr. 6...1,700	Apr. 7...1,617	Apr. 8...1,399
Mar. 30...1,713	Mar. 31...1,666	Apr. 1...1,402

Per Cent Change from Previous Year

Region	Week ended May 4	Apr. 27	Apr. 20
New England	+ 2.5	— 0.6	— 0.3
Middle Atlantic	+ 5.4	+ 0.7	+ 4.3
Central Industrial	+ 7.3	+ 2.0	+ 5.3
West Central	+ 5.4	+ 2.4	+ 3.3
Southern States	+ 5.5	+ 4.6	+ 6.1
Rocky Mountain	+13.3	+12.2	+13.8
Pacific Coast	— 9.0	— 9.1	—12.3
United States	+ 4.0	+ 0.3	+ 1.7

Electrotechnical Commission Issues Preliminary Program

Preliminary program of the two plenary meetings of the International Electrotechnical Commission to be held in The Hague from June 18 to 22 and in Brussels from June 24 to 27 has been issued. Sessions will cover rating of electrical machinery, hydraulic turbines, steam turbines, standard voltages and currents and high-voltage insulators, rules and regulations for overhead lines, electric cables, switchgear, electronic devices and electrical accessories. A special feature in Brussels will be the 1935 Universal International Exhibition, which will be very extensive and contain exhibits from a large number of countries. It will include important electrical installations, both on show and in actual operation.

•

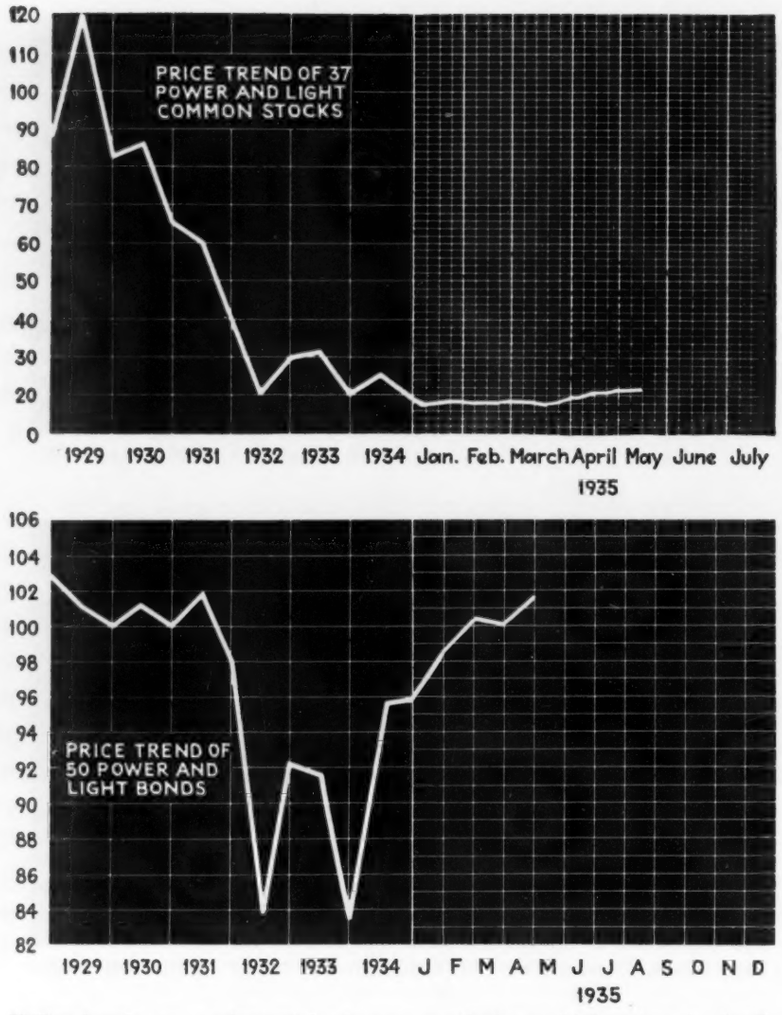
March Output 3 per Cent Over 1934

Energy production in electric public utility plants of all classes (not exclusively central station) during March rose to 7,973,000,000 kw.-hr., the U. S. Geological Survey reports, or 3 per cent over the like figure last year, compared with 7,489,000,000 kw.-hr. in February. The latter was a gain of 6 per cent over 1934. Daily output declined 4 per cent from the preceding month; the average change is a decrease of 2 per cent. Output from water power attained the unusually high ratio of 45 per cent of the total.

Regional changes in per cent referred to the preceding year were as follows:

	Dec.	Jan.	Feb.	Mar.
United States	+ 8	+ 9	+ 6	+ 3
New England	+ 6	+ 9	+ 4	+ 3
Middle Atlantic	+ 4	+ 7	0	— 1
East No. Central	+ 5	+ 8	+ 7	+ 2
West No. Central	+22	+21	+16	+17
South Atlantic	+12	+ 9	+13	+ 4
East So. Central	+27	+19	+18	+14
West So. Central	+ 9	+ 9	+ 5	+ 7
Mountain	+10	+ 7	+10	+10
Pacific	+ 6	+ 8	+ 5	0

Utility Bonds Advance; Stocks Firm



Utility bonds, in a substantial advance, reached new high prices in April. "Electrical World" index, 101.7; March, 100.0. Firmness continues in the utility stock list. "Electrical World" index, 22.1, the highest point since last July

Court Enjoins Sale of Japanese Bulbs

Japanese electric light bulbs were barred from this country in a decision rendered by Judge Paul McCormick in federal court in Los Angeles last week in favor of the General Electric Company in an action against a group of Japanese distributors. In three suits filed by the General Electric Company in the United States District Court early in 1933 it was charged that the Japanese lamps were sold at reduced prices, were of short life, used more energy than those of the American electric lamp industry and violated the General Electric's patent rights.

Besides directing that decrees be entered against the defendants for the issuance of injunctions prohibiting further sale of Japanese lamps in the United States, Judge McCormick allowed the General Electric Company to recover from the defendants such damages as may have been caused by the past sale of the Japanese lamps in this country in violation of the patent.

•

Boston Edison Stockholders Give Consent to Mortgage

Stockholders of the Edison Electric Illuminating Company of Boston have authorized its directors to create a mortgage to secure an issue of bonds. The articles in the call for the meeting relating to the issuance of preferred and capital stock were not voted upon, it being the intention to confine the financing to mortgage bonds. Frank D. Comerford, president, advised the stockholders that directors had agreed the financing should take the form of first mortgage bonds and no stock. The initial issue will be $53,000,000 of bonds, which, with cash on hand, will be used to take up by call the $55,000,000 coupon notes due on July 16, 1937, and November 2, 1937. An additional $16,000,000 of bonds will be earmarked to take care of the non-callable note issue of an equal amount maturing April 15, 1936.

•

Business Development Group Appointed by N.E.M.A.

Frank C. Jones, president of the National Electrical Manufacturers Association, has recently appointed the new Business Development Advisory Committee, with C. E. Swartzbaugh, president of the Swartzbaugh Manufacturing Company, as chairman. S. L. Nicholson, assistant to the vice-president of the Westinghouse Electric & Manufacturing Company, has been named vice-chairman.

•

Power Strike Unsettled

Despite the action of union officials rescinding the strike order (ELECTRICAL WORLD, April 27, page 45), 2,200 electrical workers of the Illinois Power & Light Company failed to return to their jobs. Light and power services in the territory have been limited and in some cases entirely halted. Employees went on strike early in April. The causes are obscure, company officials maintaining that the men have presented no demands. Governor Horner has instructed the state Commerce Commission to proceed at once to compel a resumption of electrical, water and gas services.

•

Electrical Code Amended

Amendment to the code for the electrical manufacturing industry prohibiting members from selling below current net price lists has been approved by the National Industrial Recovery Board, effective May 10.

The change would amend the third paragraph of Article X to read: "No employer shall quote, bid, offer to sell, contract to sell or sell directly or indirectly by any means whatsoever any products of the industry covered by the provisions of this article at a price lower or at discounts greater or on more favorable terms of payment than those provided in his current net price lists or price lists and discount sheets."

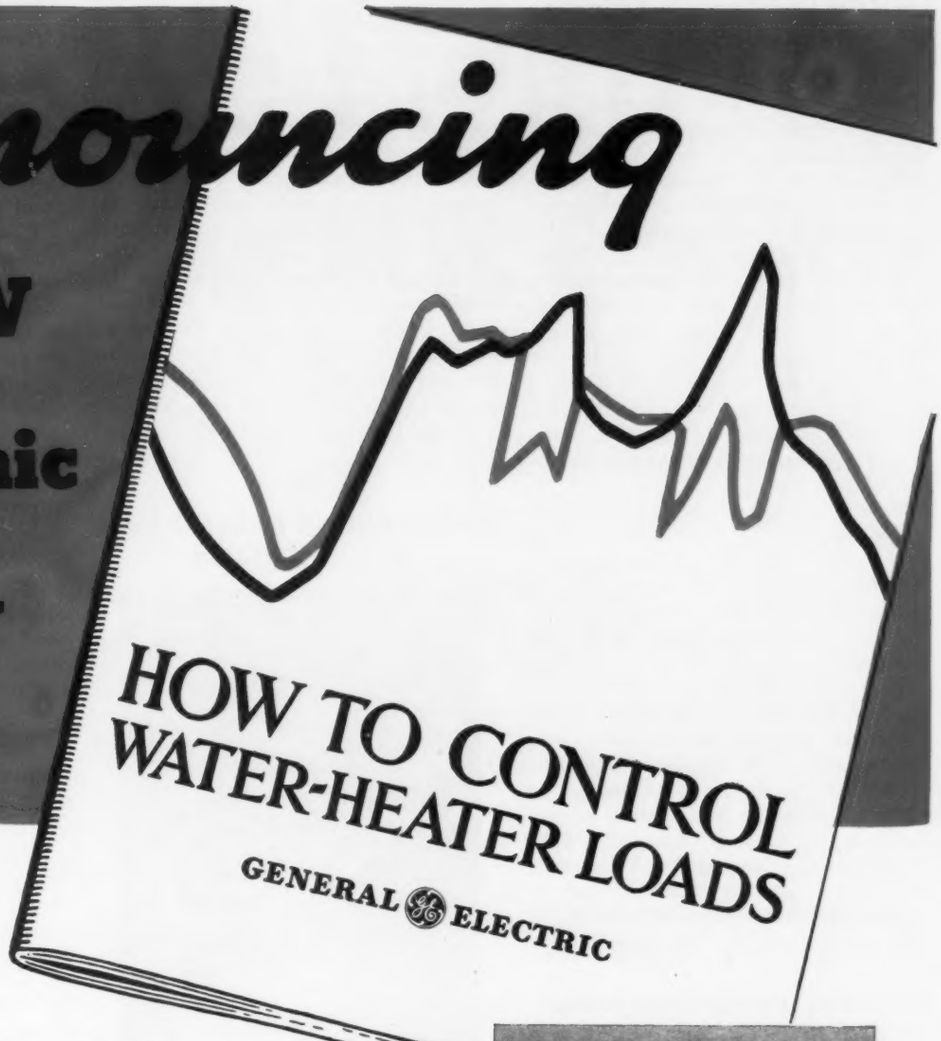
New York Metal Prices

	Apr. 24, 1935 Cents per Pound	May 8, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.75	3.75
Antimony	14.00	13.00
Nickel ingot	35.00	35.00
Zinc, spot	4.45	4.575
Tin Straits	50.75	50.50
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Announcing

a NEW Economic Study



HERE is a study that presents the facts—clear, concise, and specific—as to just what control means. It is of direct value to every one planning to extend this domestic electric service.

You can make electric water heating most profitable by controlling such loads. This report explains how. It is the result of a year's investigation by engineers of the General Electric Company and of the Edison General Electric Appliance Company. It shows how, by controlling water-heater loads, you can serve customers better, improve load factors, and increase revenue.

For a copy, send coupon to the nearest G-E sales office or General Electric, Dept. 6A-201, Schenectady, N. Y.

GENERAL ELECTRIC

ANSWERS THESE QUESTIONS

How much of a load builder is the electric water heater?

•

How much value is there in the control of water-heater loads?

•

What types of control are available?

•

How determine which type is best adapted for a particular system?

General Electric Company
Dept. 6A-201, Schenectady, N. Y.

Please send me a copy of your publication GEA-2058, "How to Control Water-heater Loads."

NAME_____

COMPANY_____

ADDRESS_____

440-52

COUPON for your convenience

Ontario Commission Reports $3,000,000 Deficit

In its twenty-seventh annual report, tabled in the Ontario Legislature last week, the Hydro-Electric Power Commission for the fiscal year ended October 31, 1934, reported that consolidated revenue fell short of meeting costs, including appropriations for contingencies and obsolescence, by approximately $3,000,000. To meet the bulk of the deficit $2,869,943 was taken from the contingency reserve. The main deficit fell in the Niagara system, where power costs were expanded by an outlay of $6,872,793 paid for power purchased, compared with $1,638,536 in 1929. In the same years the comparative revenue was $22,543,780 and $21,664,808.

The commission reports revenue from municipal electric utilities and other power customers of $25,303,656 and revenue from customers in rural power districts of $2,909,596, a total of $28,213,252. Operation, maintenance, administration, interest and other expenses were $26,283,475 and reserves for sinking fund, renewals, contingencies and obsolescence provided in the year were appropriated at $4,823,319, a total cost of $31,106,794. An appropriation of $2,869,943 from the contingencies reserve supplemented the total revenue of $28,213,252 in meeting costs and the small balance of $25,598 was charged to municipalities under cost contracts.

•

Operating Problems Solution Presented at Fresno Meeting

Climaxing one of the most successful years in its history, the Pacific Coast Electrical Association met in Fresno, Calif., April 11 and 12. Under the able direction of Arthur H. Markwart, president of the association and vice-president of the Pacific Gas & Electric Company, the association revised its usual procedure in an effort to obtain a broader discussion of the industry's problems.

In the fall eight problems of vital importance to the industry's activities were presented to the membership at large for solution. At the Fresno meeting the prize-winning solutions from more than 700 entries were presented to the membership. This number of entries represented more than 30 per cent of the entire membership of the association and this, plus the fact that attendance at the Fresno meeting was over 240, was evidence of the wide interest and enthusiastic support being given the new program. Prize winners were numbered from among every branch of the industry, including salesmen, accountants, engineers, contractors and linemen.

The problems which aroused this discussion were as follows: How important is voltage regulation? What are the most practical and economical methods of accomplishing it? How much free repair or maintenance service can and should the power companies give their consumers? What are the most effective methods of increasing domestic use of electricity? What are the most effective methods of increasing commercial, industrial and agricultural uses of electricity? From an operating standpoint, what types and how much load can be added to existing electrical facilities? How can the cost of electric distribution be lowered? What are the most effective methods of improving co-operation within industry? What are the most effective methods of improving customer good will?

•

ELECTRIC WELDING IN SALT PROCESS

Lincoln Electric Company

In this 25-ton evaporator wet salt is stirred up by a bronze propeller, circulated through 828 copper tubes, distilling off the water. This giant salt maker, designed by Clinton S. Robinson & Associates, Chicago, is about 50 ft. long and 12 ft. in diameter at its widest point. It was built by the Wellman Engineering Company, Cleveland, Ohio, entirely by shielded arc welding.

New Brunswick Properties Offered to City

Faced with the necessity of selling out or making a large expenditure on its generating plant, the New Brunswick Power Company has placed before the City Council of St. John, N. B., a proposal that the city purchase all the assets of the company. J. M. Robinson, representing the company, suggested that a committee be named by the Council to confer with him on a price that would be mutually satisfactory. Mayor J. W. Brittain announced that the city would negotiate with the Council of five members acting as the committee.

The city now operates the Civic Power Commission, supplying light and power, energy being obtained from the Musquash hydro station, controlled by the New Brunswick Electric Power Commission. If the sale of the New Brunswick Power Company assets is completed the city will have full control of the light and power situation, not only within the city limits but as far into the suburbs as 10 miles.

•

Accounting System Devised for Municipal Plants

New York Public Service Commission has prescribed a uniform system of accounts for municipal electric utilities operating in the state. This is the first time that an accounting system has been prescribed for municipally operated plants by either the present commission or its predecessor. The new system for municipal plants follows closely the system of accounts for electric corporations in respect to operating property, operating income and operating expense accounts, and provision is made for recording all payments or services interchanged between the electric utility and the municipality owning it. There are 52 municipal plants in New York State to which the new accounting system applies.

•

Spokane Utility Wins Suit in State Supreme Court

Reversing the ruling of the Thurston County Superior Court, the Supreme Court of the state of Washington has rendered an *en banc* decision in which it declared that privately owned public utilities doing an interstate as well as an intrastate business are exempt from the provisions of a law passed by the 1933 Legislature giving the State Department of Public Works authority over the payment of dividends and issuance of securities by utilities. Following the passage of the law, the Washington Water Power Company brought suit to determine the validity of the law.

Measure Lightning

this NEW, Easy Way

Magnetic link of special high-retentivity steel

Simple equipment enables you to find where lightning hits your lines and the magnitude of the stroke

Surge-crest ammeter

THIS is the simplest, easiest, and least expensive method yet devised for making a survey of lightning currents passing through transmission towers or through protective devices.

A dozen operating companies have proved that the knowledge gained by its use has shown where improvements could be made.

THE EQUIPMENT, AND HOW IT WORKS

Two magnetic links, made of specially prepared and calibrated high-retentivity steel, are mounted by means of special brackets on the leg of a transmission tower, or other locations where surge currents are to be measured. When a surge, caused by lightning, passes through the tower leg, the links are magnetized. With a special indicator, a lineman can quickly determine which links have been magnetized.

These he sends to the laboratory, where they are calibrated on a special instrument, known as the surge-crest ammeter. In this way an accurate measurement of the surge current is obtained. The links are then demagnetized and used again.

Because of the low cost of the small links, an entire transmission line can be equipped at a reasonable expenditure.

General Electric can furnish the complete equipment—links, brackets, shields, surge-crest ammeter, and the other accessories. For further information, see Bulletin GEA-1943.

OTHER G-E EQUIPMENT FOR MEASURING LIGHTNING SURGES

Automatic, high-speed oscillograph, which begins to record in one-half cycle

Cathode-ray oscillograph

Surge-voltage recorder—with either stationary or movable film

Surge indicator

Lightning-severity meter

Lightning-stroke recorder

THE SURGE-CREST AMMETER

When a magnetized link is placed in the troughlike receptacle on the front panel, the meter gives the crest value of current and its polarity. From such measurements on the two links the amount of oscillation of the current can also be determined.

OTHER EQUIPMENTS

General Electric has long been a pioneer in lightning research. In its high-voltage and research laboratories in Pittsfield and Schenectady, experiments are continually being carried on to develop equipment that will enable power companies to protect their lines against lightning.

Much work has been done in the field of measurement, and some of the equipment that G.E. can now offer is listed in the box at the left.

For complete information about any of this apparatus, address the nearest G-E sales office or General Electric, Dept. 6L-201, Schenectady, N. Y.

430-49

GENERAL ELECTRIC

Reducing Cost of Seasonal Service

By E. A. BOWMAN
Distribution Engineer
Camp F4, Laurel, Miss.

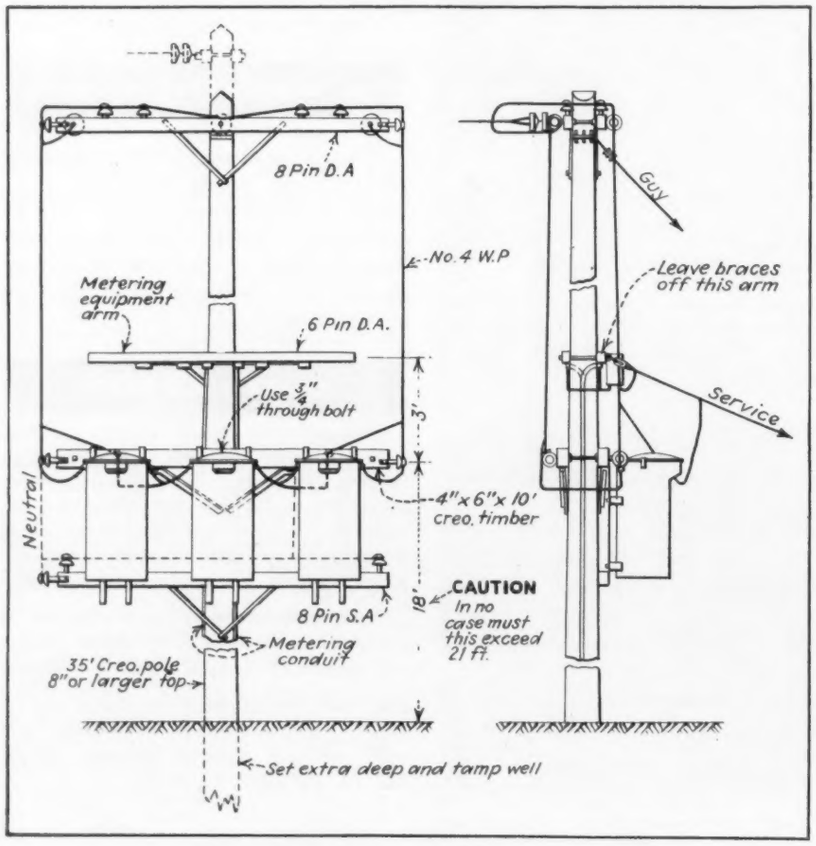
Serving the gin loads, which ordinarily use power only a few months each year, has caused gray hair on many a manager's head. To lower the initial investment for service facilities, the structure shown was designed. It is adapted to other seasonal services.

Several departures from normal practice were found advisable. The cutouts are placed at the junction with the main line so the entire installation could be killed during off seasons. To obtain maximum service from the lightning arresters, they are also installed on this pole and connected for year-round service. Removal of these fixtures from the main structure materially reduces the number of jumpers and permits a single-pole structure.

A single pole is fully capable of carrying three 37½-kva., 11/2.3-kv. transformers. A 4x6-in x 10-ft. creosote double arm with bow braces supports the tranformer. Metering equipment arms just above the transformers further reduce jumpers and simplify the structure.

Field experience with this construction indicates that the structure can be framed on the ground, reducing labor.

Elimination of one pole, platform, cross timbers, buses, guard rails, etc., reduced the cost of this seasonal-service structure from $172 for a two-pole structure to $46 for the new one, exclusive of common items. This does not constitute all of the savings. Steel-platform supports, platform timbers, guard rails and some small items stocked for two-pole structures could be either reduced or eliminated, thus reducing the funds tied up in such materials. All items for the single-pole structure are found in most large distribution-system storerooms. The latter item may not be appreciable, but a reduction of $126 in the investment for each installation would help make many customers profitable.



Single-pole structure for seasonal service

This structure is designed for 2.3-kv. service for straight or small-angle "pull" into customer. If structure must be set at 90 deg. to service, a taller pole with a buck arm for primary can be used so transformer and service arm will always face service outlet.

•

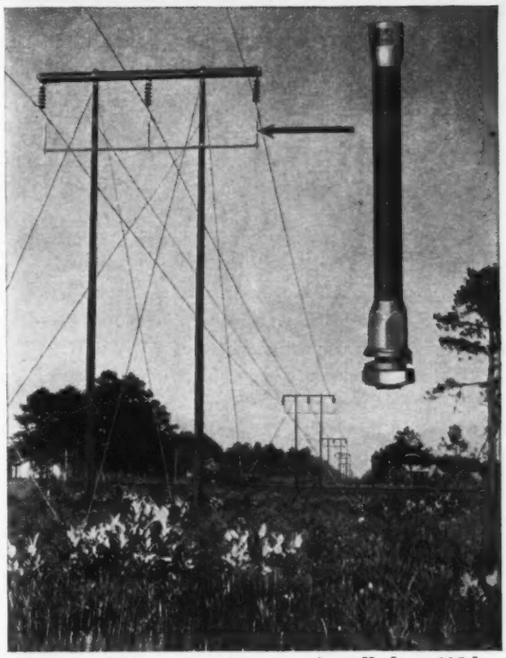
Network Capacities in Emergencies

By LESLIE J. WEED
Electrical Engineer,
Edison Electric Illuminating Company of Boston

In a network composed of standard 150-kva. transformer banks symmetrically spaced so as to provide 20 per cent spare capacity there will be 30 kva. supplied in each of the four directions from every bank, assuming all the banks to be in service, which means that between any two banks there is 60 kva. of connected load, and each main thus normally carries a maximum of 83 amp. In the event of a transformer being out of service the four adjacent banks would pick up its load and each main terminating at the out-of-service bank will carry 167 amp. This is the maximum current any main is required to carry if the transformers are uniformly distributed.

The 83 amp. (normal) or 167 amp. (emergency) will be the maximum for only the few hours of daily peak load. A 123 per cent load of 154 amp. could be carried three hours on a No. 1/0 cable (rated 125 amp.) following normal maximum loading of 67.5 per cent (83 amp.). Even though 154 is less than the computed 167 amp., this No. 1/0 cable should suffice because of cooling opportunity as loads are only from 15 (at night) to 85 per cent (in the day) of the peak. The No. 2/0 cable, however, with its 140-amp. rating would be only 59.5 per cent loaded at 83 amp. and thus could carry 128 per cent of rating or 180

COMPLETE LIGHTNING PROTECTION ....from the Generator to the Meter



G-E expulsion protective gaps installed on 115-kv. transmission line of Tide Water Power Company, Wilmington, N. C.

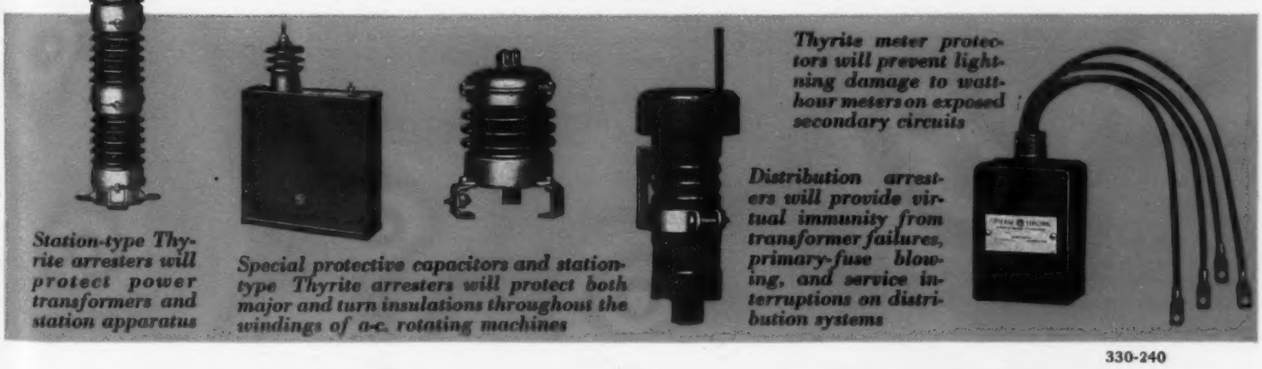
Modern Lightning Protective Equipment for Every Part of the Modern Electric System

Protect Your Transmission Lines

EXPULSION protective gaps will maintain service continuity on your transmission lines by preventing line outages or damages to insulation which result from lightning flashovers of the line insulation. They provide a simple and economical means of attaining practically lightning-proof transmission lines.

Expulsion protective gaps are easy to apply to either new or existing lines. Installation costs are low since mountings can be furnished to fit any type of line structure, and no costly grounding at structures is required.

The excellent operating records of expulsion protective gaps on several important transmission lines have definitely established the reliability and economy of this modern form of line protection. For complete information, address the nearest G-E sales office or General Electric, Dept. 6H-201, Schenectady, N. Y.



Station-type Thyrite arresters will protect power transformers and station apparatus

Special protective capacitors and station-type Thyrite arresters will protect both major and turn insulations throughout the windings of a-c. rotating machines

Thyrite meter protectors will prevent lightning damage to watt-hour meters on exposed secondary circuits

Distribution arresters will provide virtual immunity from transformer failures, primary-fuse blowing, and service interruptions on distribution systems

330-240

GENERAL ELECTRIC

amp. for a three-hour period of overload with a bank out of service, which would probably be more suitable for use with the 150-kva. units.

Similar studies for mains between 300 kva. and 450 kva. banks indicated a choice between four 350,000-circ.mil cables and a multiple main of seven No. 2/0 cables for the former and a choice between four 500,000-circ.mil cables and a multiple main of seven No. 4/0 cables for the latter. As will be shown in a later article on voltage regulation, the choice of the proper type of cable main will be governed by permissible voltage fluctuation.

•

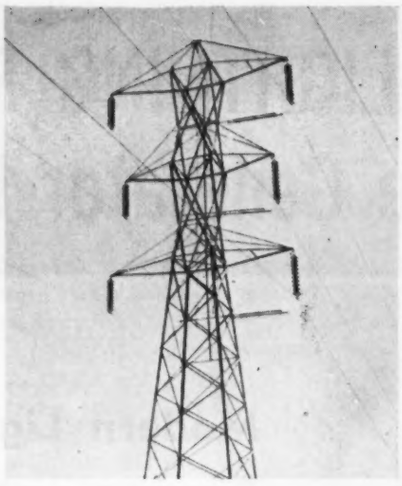
Flashover Protectors Avoid Rebuilding

By E. W. HATZ
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.*

Energy from the new Port Washington station of the Milwaukee Electric Railway & Light Company will be transmitted into the system on a 132-kv. circuit which for about a quarter of its 23-mile length will be carried on new towers. The remainder of the circuit will occupy an available position on an existing line. The new towers are of a design embodying present knowledge of transmission line performance, double ground wire, generous spacings, co-ordinated insulation, spacing related to footing resistance, etc.

But the towers in the existing line were designed when it was believed that interruptions were caused by induced strokes and, consequently, it was good design to place the ground wire as close to the conductors as was possible without making contact with them. As a result, the separation between the ground wire and conductors at mid-span is not sufficient to avoid flashover if the footing resistance happens to be less than 10 ohms. Also, the ground wire is not in a position where it will intercept many of the strokes which would otherwise hit the conductors. Taking these limitations into consideration, it was found from performance data that on the portion of the circuit carried on the old towers approximately 2.6 interruptions per 100 miles per year were to be expected. The estimated interruptions for the length of line on the new towers was only 0.5 per 100 miles per year, less than one-fifth.

*Extracted from paper to Wisconsin Utilities Association. See ELECTRICAL WORLD, March 2, 1935, page 58.



Flashover protectors added to line

Operation of the old line could have been greatly improved by reconstructing the towers to provide an additional ground wire, space for more insulators in each suspension string and greater clearance from the conductors to steel. This, however, would have required a substantial expenditure, often equal to the cost of a new tower, and consequently this plan of reconstruction of the towers was abandoned in favor of the Deïon flashover protector.

•

Diesel Plant Bid $200 per Kw.

Analysis of bids submitted by five Diesel manufacturers for a nominal 1,750-kw. plant in Arizona shows total bids ranging from $138,000 to $186,000. These are exclusive of land, buildings, fuel storage, foundations and erection. The plant is for standby purposes in connection with the San Carlos project and is to be built by the U. S. Indian Irrigation Service, Department of the Interior.

Clark J. Wells, superintendent of power, has evaluated these bids on the basis of comparable net thermal and electrical efficiencies and finds that all bids fall within the range of $197.67 and $213.08 per kilowatt. In the accompanying tabulation the item "auxiliaries" covers the main fuel pump, oil filter, lubricating oil purifier, starting air compressor and air storage tank. Bids on the auxiliary engine-driven generator (33 to 40 hp., 15 or 20 kw.) ranged from $1,245 (Westinghouse) to $2.475 (Enterprise).

Diesel Equipment Delivered at $53 to $68 per Horsepower

	Trans-American Construction Co.		Nordberg Manufacturing Co.		Enterprise Engine Co.	Worthington Pump & Machinery Co.	Fairbanks-Morse & Co.		
Bid No.	2	2A	3	3A	4	5	6A	6B	6C
Total capacity, hp	2,490	2,655	2,778	2,600	2,800	2,514	3,150	2,450	2,800
Number of engines	3	3	3	2	3	3	3	2	2
Speed, r.p.m.	240	225	257	257	277	225	300	200	300
Guaranteed B.t.u. per net kw.-hr.	10,100	10,110	9,945	9,890	12,500	10,487	10,315	10,275	10,225
Circulating water, gal. per min.	200	240	310	435	225	335	460	460	460
Lump sum engine bid	127,075	145,850	150,604	136,746	83,949	134,000	149,544	113,434	129,385
Unit price per hp	51.10	55.10	54.21	52.55	29.98	53.30	47.47	46.38	46.20
Auxiliaries, total bid	8,041	8,808	5,785	6,158	19,663	9,151	6,040	6,380	6,682
Unit price per hp	3.24	3.32	2.08	2.37	7.02	3.64	1.91	2.60	2.38
Heat exchanger and pumps	3,085	3,220	3,735	3,020	11,024	1,745	3,635	2,809	2,459
Unit price per hp	1.24	1.21	1.345	1.16	3.94	0.695	1.15	1.00	1.00
Generators, rated kva	2,139	2,286	2,437	2,250	2,625	2,225	2,385	18.60	2,134
Total bid	25,327	28,183	21,516	16,456	31,512	26,024	21,990	15,580	16,693
Unit price per hp	10.20	10.60	7.74	6.33	11.25	10.351	6.98	6.36	5.95
Spare parts, total bid	304	312	320	373	1,125	284	328	328	328
Unit price, per hp	0.122	0.118	0.115	0.144	0.402	0.105	0.10	0.10	0.10
Total, all returns	163,832	186,373	181,960	162,753	147,243	171,039	181,537	138,531	155,546
Evaluated, per net kw	206.25	213.08	198.79	197.67	204.58	208.19	207.40	204.89	201.56

Transportation AT LOW COST

ECONOMY is the sum and substance of truck ownership. You may do without economy in a car but the truck is a stern business proposition. It has always been so—*but today more than ever.* For more than 30 years International has sought one objective—transportation at the lowest possible cost for the man with loads to haul. That is the root and heart of International Truck success.

That 30-year endeavor bears sound fruit today in the new Internationals. Their unfailing day-in and day-out service will give you a new idea of dependable truck performance. And every mile they run and every load they haul will be a revelation to you in lower figures on your cost sheets.

The more minutely you examine their advanced design and construction the easier you will understand their stamina and performance. And the more you talk to owners the more impressed you will be with the low-cost hauling Internationals deliver. Sizes range from ½-ton to 10-ton. Sold and serviced through 230 Company-owned branches, and dealers everywhere.

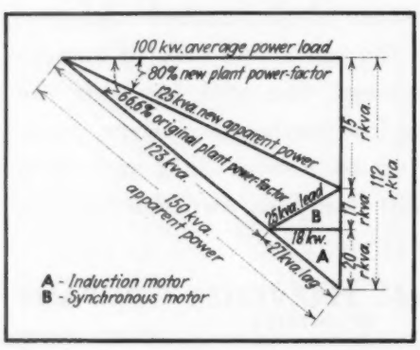
INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois

Illustrated below is a new Half-Ton Model C-1 International Truck with pick-up body owned by the Winnipeg Electric Co., Winnipeg, Canada.

INTERNATIONAL TRUCKS

P. F. Correction Earns 50 per Cent

In a small rubber mill having machinery imposing large temporary demands, substitution of a 30-hp. synchronous motor for an induction motor of the same size saved $480 yearly in the power bill. The mill averages 100 kw., eight hours per day, or 20,000 kw.-hr. per month, and the energy charge at 2 cents per kilowatt-hour came to $400. The demand charge, which is based on $2 per month per kva. for 80 per cent of 150 kva. (the original power factor being 66.6 per cent), came to $240 a month. With induction-motor drive the total bill was $640, whereas with the synchronous motor it was $600.



Effect of substituting 30-hp. synchronous motor for induction motor

Both motors ran at about 66 per cent rating. Apparent kva. of installation before change was 150; after change, 125. Solution of triangles by determining lengths of hypothenuses and sides for required power-factor angles gives motor requirements for the case. Triangle A shows the power factor of the induction motor and triangle B shows that of the synchronous unit when carrying 18 kw. with the effect on the total mill installation.

Substitution of the synchronous motor produced the results shown in the diagram, raising the mill power factor to 80 per cent lagging. The induction motor carried 18 kw. at 66.6 per cent lagging power factor, but the synchronous motor carried this load at 70 per cent leading power factor. The change cost $960 and was wiped out as to expense in two years by the $480 per year over-all saving achieved.

Besides the savings in demand charges there was a reduction in the copper losses in the plant wiring, as only 125 kva. had to be distributed instead of the original 150 to deliver the same 100 kw. of true energy used in machinery operation. Better voltage regulation at each motor assured more constant speed and less heating with the synchronous unit in service. This information was furnished by Brooks Faxon, Wagner Electric Corporation, Boston.

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Electric Sterilizers for Stuffed Products

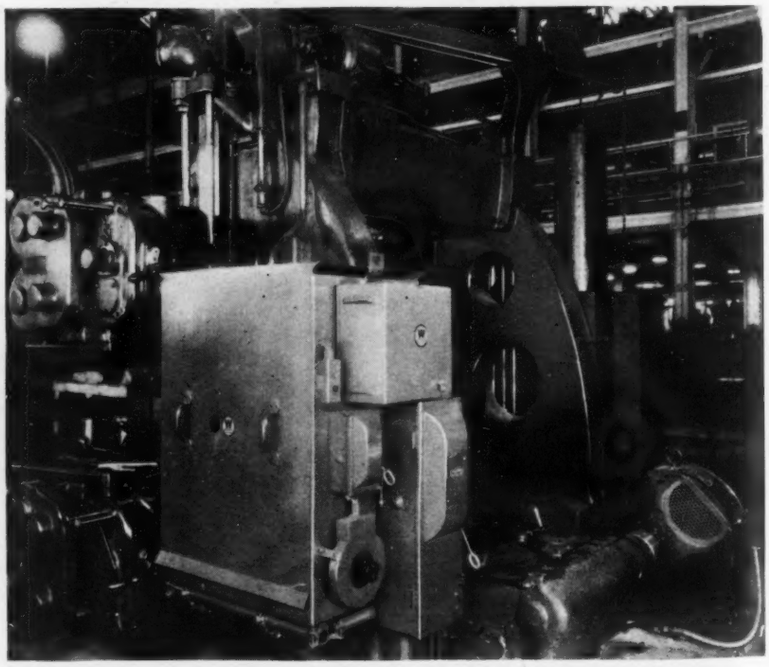
Dry heat supplied by electricity has been found highly effective in sterilizing mattresses, overstuffed furniture, etc., prior to sale. After initial experiments it was found desirable to expose the articles to be sterilized to 230 deg. F. for a period of one hour, with the additional use of 32 oz. of formaldehyde for each 1,000 cu.ft. of displacement. In the electric ovens used for this work, forced circulation of air is provided by blowers.

The ovens are about 8 ft. wide x 6 ft. high, and have depths ranging from 8 to 16 ft. The heating elements were located on the two side walls close to the floor and behind baffles. An oven 8 ft. deep had a capacity of 15 kw., 20 kw. being used on the 12-ft. oven and 30 kw. on the 16-ft. installations. In normal operation the oven would reach the required temperature in about 45 minutes. It was found desirable to keep the protracted exposures of painted and varnished furniture below 230 deg. F. in order to avoid blistering.

The cost of operating these electric ovens, which were built with 3 in. of high-grade insulation, is dependent

[*Continued on page 61*]

Steel-Clad Control at the Machine



Push-button control, speed control, safety switches and contactors for this motorized machine in an Eastern industrial plant are conveniently mounted in an assembly of steel-clad cabinets. Their interiors are nevertheless readily accessible for inspection and maintenance.

upon the number of loads put through per day. Under average conditions, with energy at 2 cents per kilowatt-hour, the cost of treating a normal load averages less than $1, including the cost of the formaldehyde. In some cases the revenue to the sterilizing plant has paid for the oven within 90 days of installation.

Electric sterilization of mattresses and other furnishings has the advantages of practically eliminating fire and explosion hazards, close heat control and distribution, elimination of fumes and odors except those created by the formaldehyde (which are confined within the gas-tight oven until discharged outdoors by damper opening), and provision of almost ideal working conditions. The same ovens are used for fumigating furniture to eliminate woodborers and moths. This is done by maintaining a temperature of about 100 deg. F. for eight hours, with the introduction of the proper amount of cyanide. Tests have shown that satisfactory results cannot be had with temperatures below 100 deg., especially in the elimination of woodborers.

•

Electrical Aid to Foundrymen

Electric melting has several advantages not possessed by other processes: Quick delivery of castings, flexible and easy operation, accurate temperature control, higher temperatures not otherwise attainable or controllable, higher quality and more uniform output, greater cleanliness, less scrap.

Electricity is a constant and measurable fuel. With the proper equipment electricity can be successfully used for: (1) Cold melting; (2) "duplexing" or superheating metal melted in other media; (3) melting alloys to add to molten metal; (4) mixing and superheating metal and alloys. Electricity does not change the chemical components of the charge. The use of a controllable atmosphere insures the desired metallurgical results. In terms of the foundry, these advantages follow:

(1) A better product which can often be sold at a premium; (2) a better product with fewer pounds of the lowest-price materials; (3) material can be duplicated quickly and accurately; (4) flexible equipment for the foundry, so that it can easily meet the demands for the ever-increasing numbers of alloy irons, steels, and non-ferrous metals; (5) a higher percentage of perfect castings; (6) improved machinability of castings; (7) better working conditions and more efficient utilization of plant space—no fuel to handle and store; (8) melt expensive alloys for ladle additions; (9) take care of emergency small tonnage without having to start cupola; (10) permit the use of a never-changing and thoroughly reliable melting medium at a non-fluctuating price.

•

Economies Effected in Brewery

Economies which can be effected in breweries by modernization of practices and/or of equipment, based on experiences of Gilbert Wilkes, consulting engineer, during prohibition and pre-prohibition periods were discussed at length in the February 2, 1935, issue of ELECTRICAL WORLD under the title "Purchased Power in Breweries." Due to space limitations this analysis of conditions in one brewery before and after electrification had to be held over.

It shows that, even with a 6 per cent increase in brewing, coal consumption was reduced 59 per cent, steam consumption 62 per cent, local power generation 100 per cent and city water consumption 45 per cent.

Steam and Electricity Usage in Brewery Before and After Electrification

(Period Covered Is One Month in Each Case)

	Totals		Quantities per Bbl.	
	Before	After	Before	After
Beer brewed, (bbl.)	6,104	6,461	...	...
Coal consumed, (lb.)	616,000	251,500	101	39
Steam generated, (lb.)	4,350,000	1,656,000	714	256
Evaporation, (lb. of steam per lb. coal)	7.05	6.5	...	...
Power purchased, (kw.-hr.)	3,040	70,325	0.5	11
Power factor, (per cent)	49	99	...	...
Demand, (kw.)	29	165	...	...
Power generated, (kw.-hr.)	9,160	0	1.5	...
City water consumed (cu. ft.)	323,365	178,000	52.8	27

Distribution of Costs

Electric Service

	Consumption (Kw.-Hr.) Before	After
Purchased Power		
Bottling plant	2,100	3,000
Ammonia compressor	0	30,925
Motor-generator set	0	19,200
Brew house and pumps	300	3,500
General lighting	640	3,090
Air compressor	0	10,700
Total	3,040	70,325
D.C. Generation		
Water pump	6,000	0
CO_2 compressor	1,500	0
Misc. brewery pumps	1,000	0
General lighting	660	0
Total	9,160	0
A.C. Air Compressor		
Refrigeration	0	3,700
Brewing	0	3,300
Wash house	0	3,700
Total	0	10,700
Motor-Generator Set		
Water set	0	10,000
CO_2 compressor	0	3,000
Misc. pumps	0	6,200
Total	0	19,200

Steam Service

	Consumption (Lb. of Steam) Before	After
Mechanical Equipment		
D.C. generation	916,000	0
Air Compressor		
(To refrigeration)	700,000	0
(To wash house)	260,000	0
Refrigeration	1,208,000	0
Brewery	305,000	356,000
Wash house	130,000	450,000
Bottling plant	360,000	450,000
Building heat	471,000	400,000
Total	4,350,000	1,656,000
City Water	Cu. Ft.	Cu. Ft.
Brewery	120,000	151,000
Wash house	133.365	.....
Boiler feed make-up	70,000	27,000
Total	323,365	178,000

The totals in these tables were metered, the distribution by departments was prorated from test data according to the operation of each department. The total steam for the various departments includes loss in the piping actually within the boundaries of these departments.

Before electrification, refrigeration was obtained by one 125-ton Corliss compressor and two 65-ton units; the latter were operated entirely to the exclusion of the larger unit. Water for cooling and other uses was obtained by a steam-driven air compressor operating air lifts in deep wells. The only use of purchased power was in the bottling plant and to drive a few minor pumps.

After electrification, the use of mechanical steam was cut out entirely. Refrigeration was secured from one 65-ton compressor. The d.c. load was carried on motor-generator set. Air for water pumping and other uses was obtained from a single-stage electrically operated air compressor. In this plant the steam piping was old and its insulation in poor condition, which caused a higher consumption than would normally occur.

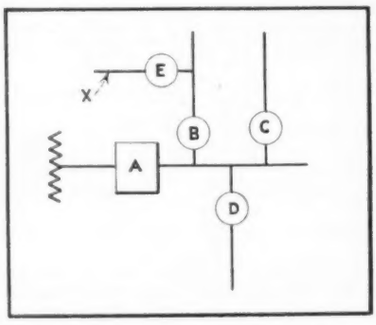
A large source of savings was permitted by banking the boilers, and eliminating boiler room labor cost whenever possible. The number of firemen employed was reduced 40 per cent after electrification. Boilers were banked from 4 p.m. to 11 p.m. normally, and the fires burnt out early Saturday afternoon and not started until Sunday night in time to heat the brewing water for Monday.

Notch Relay Clears Distribution Faults

By G. L. KENNY, Jr.
Florida Power Corporation, Ocala

Faulted branch feeders are dropped from the system by means of a new type of sectionalizing relay. It employs a notching-type mechanism which is actuated at each overload impulse and then opens a drop-out disconnect under no-load condition. The device is being developed for use in connection with a reclosing type oil circuit breaker to afford effective branch feeder protection at low cost. The functioning principle and appropriate location are detailed in the illustrations.

No attention will be required in the case of cleared faults as is required with repeater fuse installations. This is expected to constitute a considerable saving in operation because operating statistics indicate that successful reclosure may be expected on 85 per cent of all tripouts. It is not intended that the sectionalizer will supplant the oil circuit breaker wherever feeder revenue warrants one. On circuits of low revenue importance (rural and scattered urban feeders) the sectionalizer will provide oil circuit breaker protection at a fractional cost by this device, for which patent has issued to W. L. Garlington of this company.



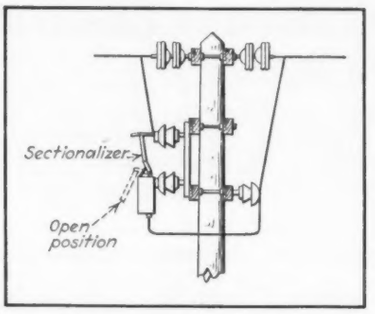
Notching sectionalizers segregate fault areas

A—OCB employing three reclosing cycles.

B, C, D,—Sectionalizing relays employing three notching cycles.

E—Sectionalizing relay employing two notching cycles.

Should a fault occur at X sectionalizers E and B both travel to first notching position and oil circuit breaker A opens circuit. Upon reclosure, if fault still persists, both sectionalizers B and E travel to the second notching position. At the instant the circuit is opened, E opens a drop-out type disconnect switch; upon reclosure of A, sectionalizer B resets to its original position, service being restored on all feeders except that one upon which the fault persists.



Sectionalizer employs single series coil

Combined with the coil are a graduated notching armature and a drop-out type switch.

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Central Heating for Russian Cities

Steam from central stations in Moscow and Leningrad, Russia, is being used to raise the temperature of water used for domestic heating, it was reported by Alan Monkhouse in an address before the Institute of Electrical Engineers in London recently. Mr. Monkhouse, a British engineer, was the central figure in the Moscow sabotage trial of 1933.

The steam from "bleeder" or noncondensing turbines is being used not only for process work in factories, but is also used for heating water that is circulated over wide areas in Moscow and Leningrad. Large thermo-electric stations are being erected on the outskirts for heating the new residential districts, it was stated. In Moscow water leaves the heating plants at temperatures from 185 to 245 deg. F., depending on conditions, and after making a circuit of about 2 miles returns at a temperature of 85 to 95 deg. F.

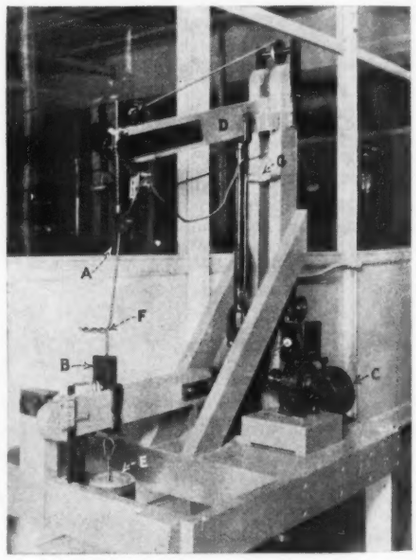
Quantity of heat distributed by hot water in Moscow and Leningrad still falls far behind New York's heating load. Moscow distributes about a quarter of that output, while the heating load in Leningrad is substantially less.

•

Stiff Kink Test for Vacuum Cleaner Cord

By C. E. BOGER
The Hoover Company,
North Canton, Ohio

Cords to be supplied with Hoover vacuum cleaners are given various rigorous tests, one of which is to determine their ability to withstand repetitive kinking. A specimen of cord is clamped between jaws and the upper jaw rotated to establish a predetermined number of twists. Tension is then applied slowly and next released quickly to let the twist form the kink. On the next movement the kink is straightened out under tension. The cord meanwhile carries the current to the driving motor. The number of cycles up to failure is registered by a counter actuated at each movement of the arm.



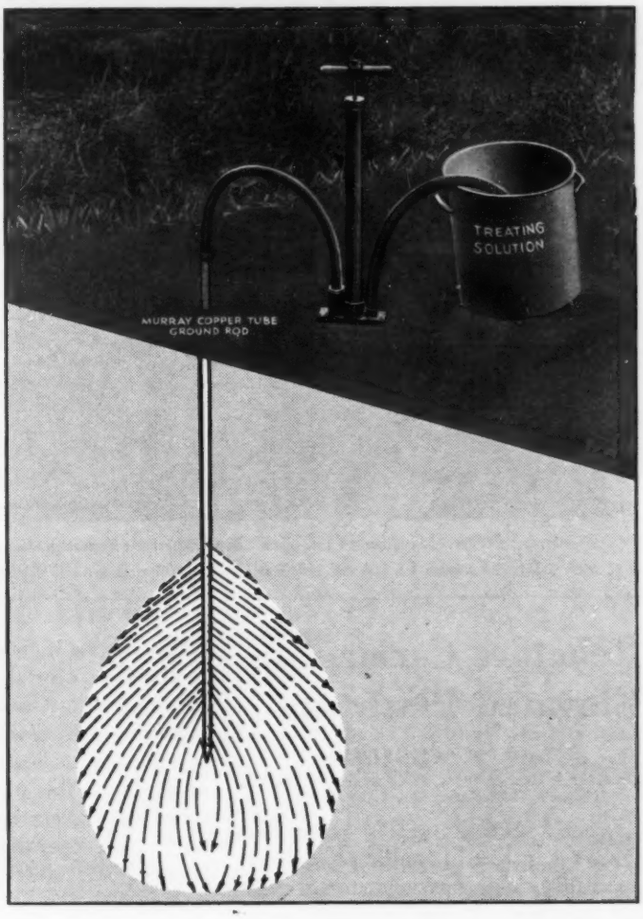
Vacuum cleaner cord tested for kink cycles

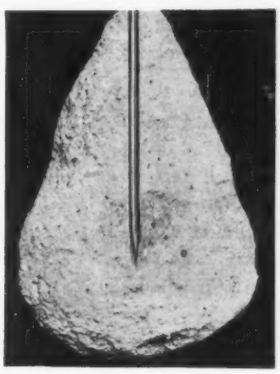
A and B, clamping jaws; C, driving motor and reduction gear; D, lifting arm; E, tension weights; F, the kink, and G, the cycle counter.

BETTER PROTECTION at LOWER COST

with

MURRAY HOLLOW COPPER GROUND ELECTRODES





How this unique type of electrode assures lower ground resistance for electric protective equipment

Better protection through lower ground resistance—that's the important reason why many electric light and power companies are specifying the Murray Hollow Copper-Ground-Electrode.

This is a driven ground-electrode . . . hollow . . . with holes at intervals through which a treating solution is passed directly into the soil at permanent moisture level.

Ground resistance can thus be reduced by Murray Hollow Copper-Ground-Electrode to 25% of initial values . . . and kept at the lower level . . . remaining unaffected by drought or moisture variation.

Our engineers welcome inquiries and consultation. Write for 8-page book of facts with charts and treating data.

Photograph shows how treating solution is pumped into a Murray Hollow Copper-Ground-Electrode. Small print shows electrolyte deposition at lower end of electrode.

METROPOLITAN DEVICE CORP.
1250 Atlantic Ave.,
BROOKLYN, N. Y.

Please send 12-page booklet, charts and price sheets.

Name .....
Position .....
Company .....
Address .....

Tokyo Cafe Adopts Luminous Architecture

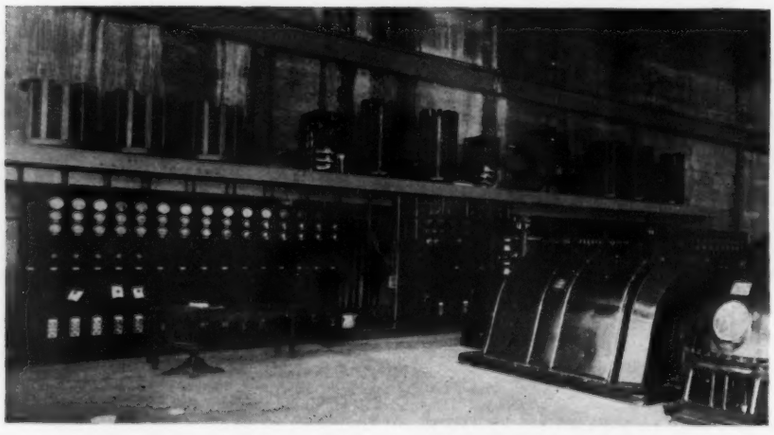
A returned traveler favors us with this picture showing the exterior surface of the Grand Ginza covered with Neon tubing — 10,000 feet used

Reactors Carried on Elevated Platform

By A. P. SCHNYDER
Electrical Engineer with George F. Hardy, Consulting Engineer, New York

When one Kraft mill grew to four times the original installation it developed that there was inadequate space for switchboard and generator room accessories. There was also insufficient interrupting capacity of the oil circuit breakers, which pointed to the necessity of reactors between bus sections and between the bus and feeder-group breakers. This accentuated the need for even more space, which was only available in a narrow area along the wall already occupied by the switchboard.

The situation was met by erecting a platform over the aisle behind the switchboard. Reactors and generator field rheostats were mounted on it, the panel uprights being extended as post uprights for this platform. The reconstruction was carried on with the mill under full operation, feeder changes being made during week-end shutdowns.



Unexpected growth met by elevated mounting of reactors

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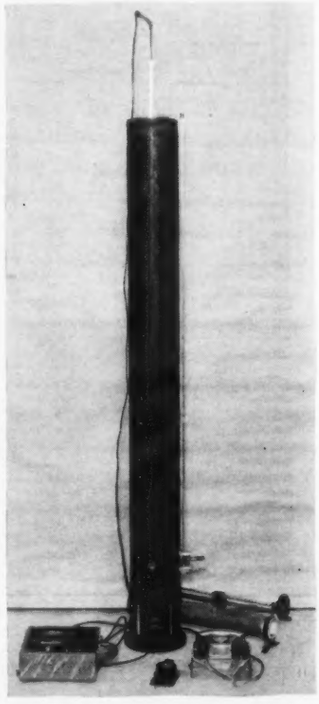
New Illuminometer Checks Sight Meters

To facilitate checking accuracy of sight meters in daily use by lighting sales engineers of the Buffalo, Niagara & Eastern Power Corporation, the meter testing laboratory of the Buffalo General Electric Company, Buffalo, N. Y., under the leadership of its assistant superintendent, Lloyd Yerger, recently devised an instrument called the illuminometer.

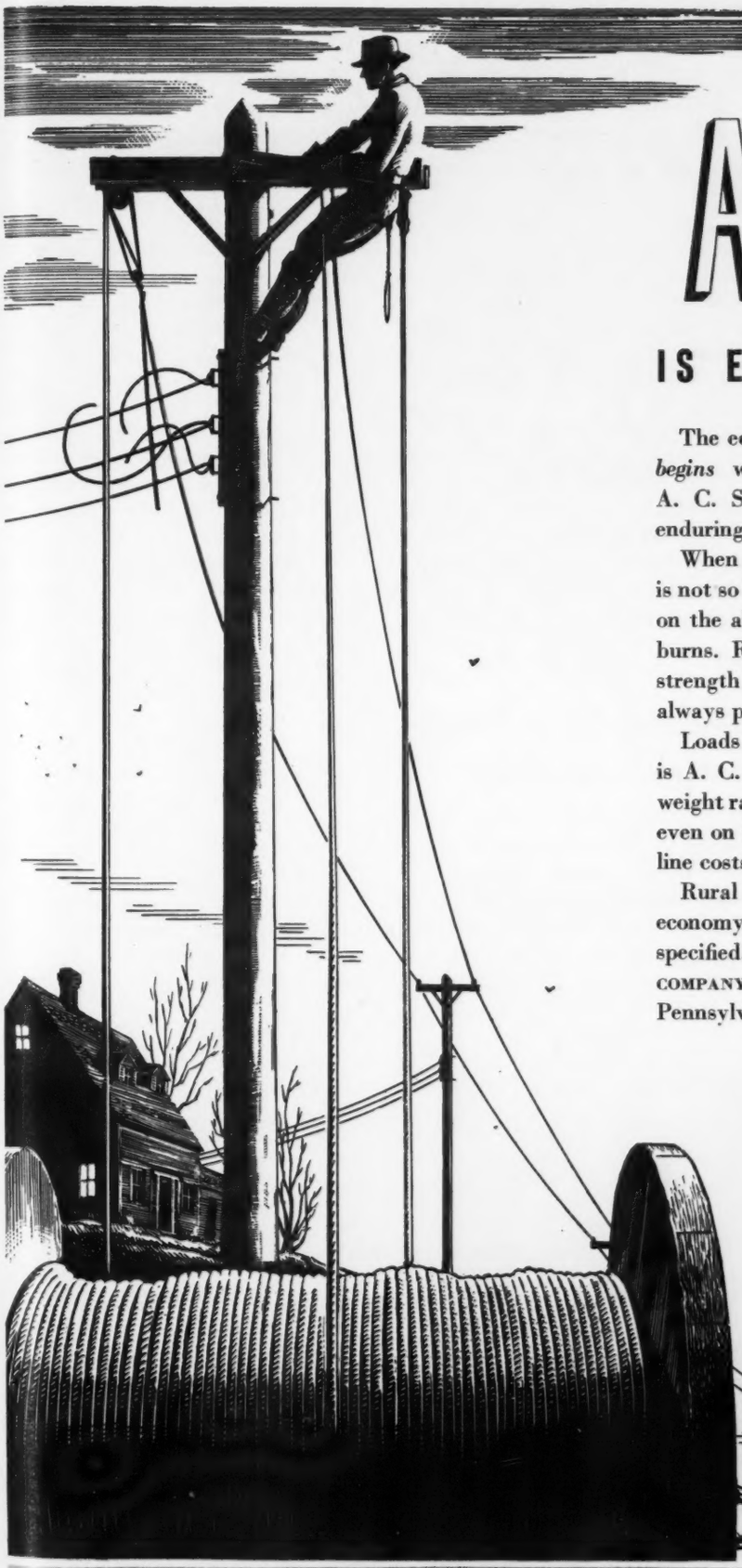
A sheet iron tube, 5 ft. high, 6 in. in diameter, with its interior painted a flat black, the illuminometer is equipped with a gear rack—a reduction gear driven by a worm shaft—that enables raising, lowering and fixing at any height up to 5 ft. lamps used to test the accuracy of the sight meters.

The sight meter to be tested is set in the base of the tube through an entry provided for the purpose. Then the entry is closed. The gear rack is adjusted to fix at desired heights lamps of desired wattage. Inside the tube, directly above the meter being tested, there is a diffusing glass that diffuses or spreads evenly the light striking the meter from the lamp above. Through an eye-piece at the base of the tube the sight meter recording is read. This reading is then compared with the recording of a standardized sight-meter cell, a cell standardized by a recognized laboratory.



Sight meters can be checked for their accuracy

Using a 25-watt inside frosted lamp, from one to 250 foot-candles; using a 100-watt inside frosted lamp the testing range can be increased up to 1,000 foot-candles.



A·C·S·R·

IS ENDURING ECONOMY

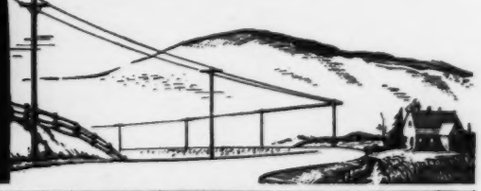
The economy of A. C. S. R. for rural lines only *begins* with its purchase. Here are two ways A. C. S. R. promises a reliability that assures enduring economy:

When the inevitable flashovers occur, A. C. S. R. is not so liable to burn deep, because the arc moves on the aluminum strands, and causes only surface burns. Remember that 50 to 60 per cent of the strength of A. C. S. R. is in the steel core, which is always protected.

Loads on strain members are less when the line is A. C. S. R. That's because the high strength-weight ratio of A. C. S. R. avoids excessive tensions, even on the long spans that are desirable to reduce line costs.

Rural lines may not be spectacular, but their economy can be noteworthy, if A. C. S. R. is specified. For the latest facts, address ALUMINUM COMPANY OF AMERICA, 1838 Gulf Bldg., Pittsburgh, Pennsylvania.

Outside meter boxes of Alcoa Aluminum cannot rust. Aluminum is highly resistant to atmospheric corrosion; needs no paint protection; never discolors adjoining surfaces. This type is die-cast. Other types made from pressed Alcoa Aluminum Sheet.



ALCOA ALUMINUM

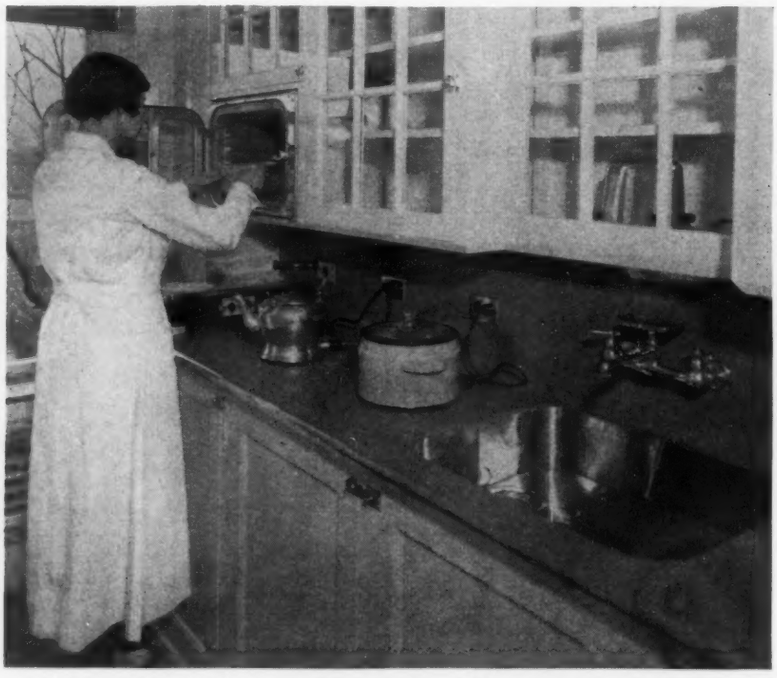
BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

"Rangeless" Electric Kitchen Try-out

A gauntlet has been flung into the electric cooking arena by the Newhall Apartments at Brookline, Mass., in the shape of a "rangeless" kitchen designed to utilize ten modern cooking devices in place of the orthodox equipment. The sponsor for the idea, Charles A. Newhall, has equipped twelve kitchens in this way at 1280 Beacon Street, and more than 200 housewives who have visited these modernized suites displayed enthusiasm to a woman over the installations. The equipment includes a 1,000-watt roaster, three 360-watt casseroles, a 500-watt toaster, 400-watt percolator, 1,000-watt tea kettle, 1,500-watt two-plate stove, 600-watt grillmaster and a 1,500-watt oven. A typical kitchen is 14 ft. long x 5 ft. 4 in. x 8 ft. 6 in high, equipped with stainless steel sink, one single and four duplex outlets, linoleum shelf, ample cupboard space and an electric refrigerator not shown in the illustration.

The apartment house owner furnishes the electrical equipment, which is designed to permit extensive service without the use of pots and kettles. It is contended that while the initial cost exceeds that of an electric range and its wiring pending the marketing of these devices in groups on a production basis, operating costs are likely to run considerably lower for small families than with ranges. Data on the energy consumption of the equipment group in a typical kitchen are to be gathered as soon as occupancy begins. Service is furnished by the Boston Edison Company on its regular "B" residential rate.



Unit cooking devices used in Brookline, Mass., in place of ranges

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"Blazing New Trails" in Merchandising

The Puget Sound Power & Light Company in western and central Washington sells domestic electricity at about half the national average price. Still the company feels that low-price electricity isn't all that is needed to promote the fully electrified home. Major electric appliances must be dramatically cut in price and given such low monthly payments and such long terms as to be practically no burden to any household. Hence the "Blazing New Trails" program of the Puget Sound company, and the initial response to the first newspaper announcement so swamped the company's telephone switchboard operators that between 4 and 6 that afternoon they fell far behind the surge of interested customers.

The foundation of the campaign is the phenomenally low, long terms on which electric ranges and water heaters are sold. These terms are so low they amount almost to a small rental charge on the appliances. Ranges are $1.95 down and the same amount per month; water heaters, $2.35 down and the same amount each month. Where normal wiring is necessary to install a range the charge is only 40 cents more on the down payment and 40 cents more per month.

This offer is for a handsome, new design "Hotpoint" range with 16-in. oven, automatic control, etc. The automatic water heater offered is equipped with a 40-gal. monel metal tank, guaranteed for 20 years. The heater operates on an off-peak rate of ¾ cent a kilowatt-hour and gives a continuous supply of hot water for the average family.

Electrical dealers, contractors and plumbers were enlisted in the campaign and a special co-operative plan was offered tradesmen and dealers whereby they will make earnings on each sale of water heaters or ranges.

Each employee of the company, other than merchandise salesmen, has the lure of special inducements to go out among his or her friends and make sales. They were offered bonuses of $5 on water heaters and $2.50 on range sales and $2.50 for heaters and $1.50 for ranges that replaced other equipment. A complete sales manual was issued to each employee, giving all the rules and conditions.

It was a well-rounded campaign and the sales force expects to achieve the sales goal of 5,000 water heaters and 5,000 ranges in 1935.

A Splendid New Line of GUTHFAN CONDITIONAIRES

Now Ready For 1935 Season

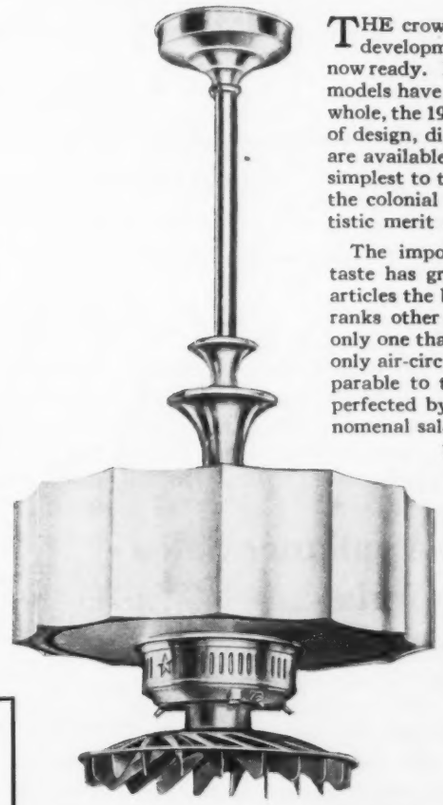
BUT, WAIT UNTIL YOU SEE THE REST OF THE AMAZING LINE IN THE NEW 1935 GUTHFAN CATALOG

In 1934 . . Triples 1933 Sales— Watch 1935 Sales Grow

As Fast or Faster

THE crowning achievement of 33 years of continuous progressive development, the new 1935 line of GUTHFAN Conditionaires is now ready. In addition to the favorites of past years, a number of new models have been added which are truly masterpieces of design. As a whole, the 1935 line far surpasses anything previously offered in beauty of design, dignity of conception and efficiency of operation. Models are available to harmonize perfectly with any surroundings from the simplest to the most ornate. Styles range from the classical through the colonial and provincial to the ultra-moderne—all of highest artistic merit and good taste.

The importance of beauty cannot be over-emphasized. Public taste has greatly improved of late years. Of two equally efficient articles the better looking will always top in sales. Guthfan far outranks other air circulating devices in efficiency and is, moreover, the only one that offers consummate beauty besides. Guthfan is also the only air-circulating device offered in combination with anything comparable to the super-efficient TOTAL-INDIRECT lighting fixtures perfected by Guth. It is inevitable, therefore, that last year's phenomenal sales growth must at least be duplicated if not surpassed in 1935. See the proof of all this in our new 1935 catalog and you will agree that here is something you cannot afford to let drift into competitors' hands.



BETTER LIGHT for Guthfan users through efficient TOTAL-INDIRECT fixtures like these means MORE CURRENT SOLD by utility companies pushing this line. Above is No. 4802, companion to the famous Guth SUPER-ILLUMINATOR. Right, a new moderne model now in highest favor.

DISTRIBUTED By Every ELECTRICAL JOBBER

Of Special Interest To UTILITY EXECUTIVES

Learn how Guthfan sales in your service area can greatly benefit your company's business. Check coupon below for special message to utility executives about Guthfan Conditionaire and the nationally advertised Guth Super Illuminator—the total-indirect lighting fixture which is proving such a sensation.

The Edwin F. Guth Company
2627-E Washington Ave., St. Louis, Mo.

NATIONALLY ADVERTISED

As heretofore, national advertising will play a leading part in Guthfan merchandising. Schedule starts with May issues totaling over 3,760,000 copies—circulation hand-picked to reach a maximum of bona fide prospects. Included are Saturday Evening Post, Time, Business Week, Nation's Business, The New Yorker, U. S. News and selected trade papers. Inquiries will be referred to local outlets. Be prepared to cash in.

FREE BOOK GIVES VALUABLE FACTS MAIL COUPON TODAY

The Edwin F. Guth Company
2627-E Washington Ave., St. Louis, Mo.

We should like to see your new 1935 catalog containing technical data, prices and illustrations of the new GUTHFAN Conditionaires.

YOUR NAME.....

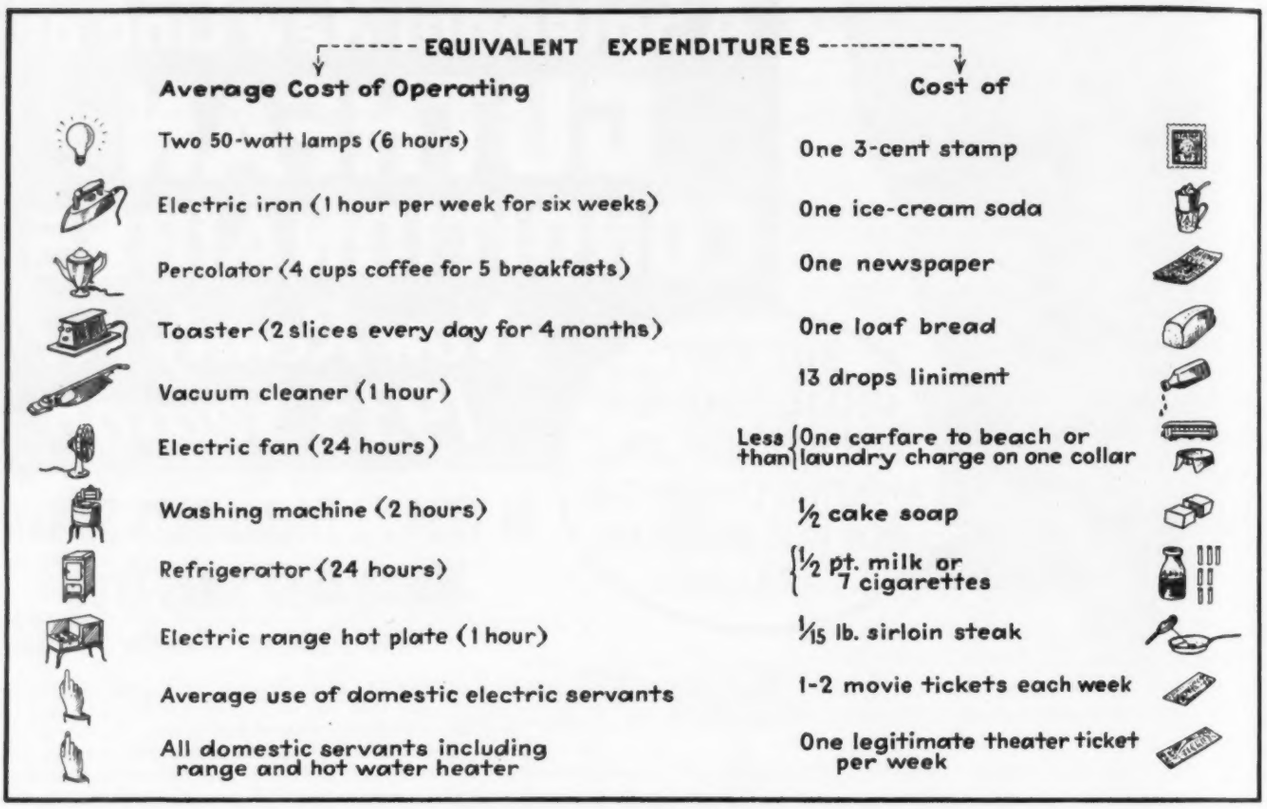
FIRM.....

ADDRESS.....

CITY..... STATE.....

UTILITY EXECUTIVES Please Check ( )

Comparisons Show Small Cost of Services


EQUIVALENT EXPENDITURES
Average Cost of Operating
Cost of
Two 50-watt lamps (6 hours)
One 3-cent stamp
Electric iron (1 hour per week for six weeks)
One ice-cream soda
Percolator (4 cups coffee for 5 breakfasts)
One newspaper
Toaster (2 slices every day for 4 months)
One loaf bread
Vacuum cleaner (1 hour)
13 drops liniment
Electric fan (24 hours)
Less than One carfare to beach or laundry charge on one collar
Washing machine (2 hours)
½ cake soap
Refrigerator (24 hours)
½ pt. milk or 7 cigarettes
Electric range hot plate (1 hour)
1/15 lb. sirloin steak
Average use of domestic electric servants
1-2 movie tickets each week
All domestic servants including range and hot water heater
One legitimate theater ticket per week

The small cost of "electric servants" shows up in a most favorable way when compared with other normal daily or weekly expenditure. Such comparisons are not new, but here are some striking ones, that may help convince the public that all the ballyhoo over rates involves one of the smallest items of the family budget.

Compelled by Competition

Air conditioning is being stimulated by competition in commercial applications. If one organization in any class of business adopts it other organizations in the same class and neighborhood follow to avoid loss of patronage. Shortly S. H. Kress will have an air-conditioned store at 39th Street and Fifth Avenue, New York City.

The adoption of 50-foot candle illumination for the first floor is partly responsible for the decision, although other advantages of air conditioning make it attractive. Woolworth's will have it in two Fifth Avenue stores. Two drug stores in Greenwich Village, one a Whelan store, will install it. One of Schrafft's candy stores in Philadelphia adopted it and so did a competitor. This chain also has an air-conditioned store in Newark, N. J. Ladies' apparel stores are adopting air conditioning to increase customer comfort and reduce spoilage of apparel from "try-ons." Ohrbach's in Newark is reported to have the last word in air conditioning. Lerner's dress shop will prove out the economic value of air conditioning. Murphy's department store in Washington, D. C., is so equipped.

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1934 Appliance Sales in Georgia

The Georgia Power Company has just completed a great load-building period in which an estimated new load of 18,551,660 kw.-hr. was added through the sale of refrigerators, ranges and water heaters alone. Besides these three appliances many more kilowatt-hours were added through the sale of small appliances.

Total sales were $2,579,142, or $22.20 per customer, and adds an estimated new business of 18,551,600 kw.-hr. annually with the appliances being sold shown in the accompanying table.

For the year 1934 the quota was $1,628,000, while a total of $2,579,-142.18 worth of merchandise was sold. This gives 158.4 per cent of quota. The sales per customer shows an index of $22.20.

Residential customers for the year 1934 increased from 106,266 to 116,-255 and the residential customer increased his annual consumption from 803.0 to 888.3 kw.-hr. This was a percentage increase of 10.6 in customers and a kilowatt-hour increase of 85.3 per cent.

Unit Sales Comparison

Georgia Power Company

Appliance	12 Months 1934	12 Months 1933
Refrigerators	10,428	3,619
Ranges	3,577	652
Water heaters	1,896	117
Water pumps	276	161
Washers	911	237
Ironers	314	40
Portable lamps	16,075	7,449
Mazda lamps	421,511	323,425
Hand irons	20,261	4,961
Toasters	940	601
Heating pads	1,585	866
Space heaters	1,569	511
Hot plates	445	234
Waffle irons	1,680	1,701

The above are selected appliances.

MORE THAN A *Million People* OWN OR OPERATE THE BELL SYSTEM

THE Bell System furnishes a nation-wide telephone service to a great and populous country—a service used for 59,000,000 talks a day. Telephone conversations per capita in this country are more than nine times as many as in Europe.

It takes 275,000 trained people to build and operate the switchboards, wires, cables, and other apparatus that make this service possible. It has taken the savings of 850,000 people to pay for the plant and equipment of the Bell System. Six hundred and seventy-five thousand own stock in the American Telephone and Telegraph Company, and in many instances other Bell securities. Another 175,000 own Bell System bonds or stock in the operating telephone companies. This invested money is the result of work and thrift. No other business organization is so widely owned by so many people.

It is owned by the people, and it is run by wage-earning men and women. Their incentive is pride in performance; in doing a good job come recognition and promotion.

Since its beginning more than 50 years ago, the Bell System has rendered a constantly improving service more and more indispensable. Usefulness to the public is the motive that keeps the telephone business going. In the true sense of the word, this is a democracy in business.

More than half the stockholders of the American Telephone and Telegraph Company, the parent company in the Bell System, are women. Nobody owns as much as one per cent of the stock.

BELL TELEPHONE SYSTEM

MEN OF THE INDUSTRY

Boston Edison Officials Assigned New Duties

Frank A. Belden, head of the promotion department of the Edison Electric Illuminating Company of Boston for the past seven years, has been appointed assistant to Leavitt L. Edgar, vice-president in charge of the operating and commercial departments. He joined the Boston Edison in 1925 as assistant to the general superintendent and from 1926 to 1928 was superintendent of the operating bureau accounts department. In his earlier career he was connected with the Georgia Railway, Light & Power Company, Ross Construction Company, Chicago, and transit companies in Chicago and Haverhill, Mass. From 1913 to 1925 he was superintendent and then vice-president and general manager of the Rockingham County Light & Power Company, Portsmouth, N. H. He is a past-president of the New England division, N.E.L.A., and has been extremely active in the national rural development field for over a decade.

F. A. Belden

Julius Daniels

Julius Daniels, assistant head, has been promoted to head the promotion department of the Boston Edison company, and also the merchandising department which was merged with the former on May 1. Mr. Daniels entered the company's standardization and testing department in 1913 and two years later was transferred to sales work, becoming the company's illuminating engineer in 1919, assistant superintendent of sales in 1926 and two years later second in command in the promotional department. Mr. Daniels is a past-president of the Illuminating Engineering Society and has been active in the improvement of lighting standards on a national scale. Recently he has been head of the Boston air condition bureau, which was created to co-ordinate and stimulate this load-building activity in the eastern New England section. John J. Caddigan will continue as assistant head of the merchandising activities of the company, now absorbed into the promotion department, and will assist Mr. Daniels in his broader duties.

Richard Lincoln, head of the Boston Edison company's merchandising department since 1928 and its assistant superintendent from 1919, has been appointed assistant to Herbert W. Moses, head of the company's employment bureau. Mr. Lincoln joined the Edison organization in 1909. He is a past-president of the Metropolitan Electrical League of Boston and is widely known in electrical circles in the Northeast.

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► OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, was honored last week by his alma mater when the board of trustees presented an oil portrait of him to St. Lawrence University, Canton, N. Y. Dr. John H. Finley, associate editor of the New York *Times*, who gave the address of the occasion, acclaimed Mr. Young a "model for all democracy."

► ARTHUR G. HALL, chief electrical inspector Hydro-Electric Power Commission of Ontario, was elected president of the International Association of Electrical Inspectors at a meeting held recently in New York. Mr. Hall has been with the Hydro-Electric Power Commission for some 22 years and has filled the executive position of chief electrical inspector for the past fifteen years. At the present time he is chairman of the Ontario committee on the Canadian Electrical Code and is also serving on the electrical committee of the National Fire Protection Association. Mr. Hall was president of the western section of the I.A.E.I. in 1931.

J. G. Holtzclaw Heads Southeastern Group

Jack G. Holtzclaw, president of the Virginia Electric & Power Company, was elected president of the Southeastern Electric Exchange at the second annual conference held last month in Augusta, Ga. Mr. Holtzclaw has been affiliated with the Stone & Webster interests for more than 26 years and has been chief executive of the Richmond utility since 1929.

A native of Georgia, Mr. Holtzclaw first joined the Savannah Electric & Power Company following the completion of his technical studies. Later he went to Pensacola to become chief executive of the light, power and traction properties in that city. In 1925 he was appointed general manager of the Eastern Texas Electric Company with headquarters in Beaumont, Tex., and a year later, when the Gulf States Utilities Company was organized to take over the Beaumont properties, Mr. Holtzclaw was retained in an executive capacity, subsequently assuming the duties of president, the position he occupied until he went to Virginia.

J. G. Holtzclaw

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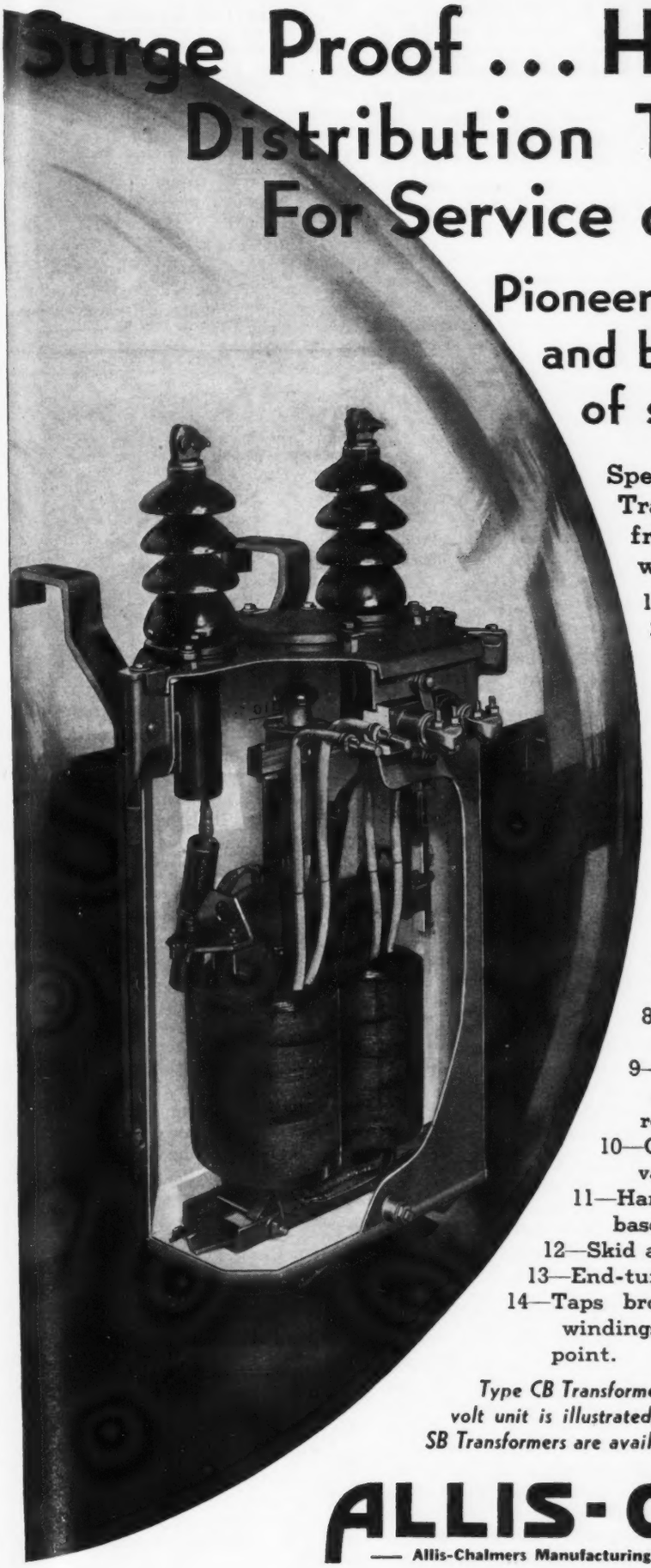
► A. L. STRICKLAND, since 1927 manager of the Molalla Electric Company, Aurora, Ore., a subsidiary of Portland General Electric Company, has been elected vice-president and manager of the Yamhill Electric Company, Newberg, Ore., another subsidiary. Franklin T. Griffith, president of the parent company, has been named president of the Yamhill utility to succeed the late R. J. Moore. Mr. Strickland retains the managership of the Molalla company. Starting out in the utility business at the time of the installation of the Ashland, Ore., municipal plant in 1908, Mr. Strickland man-

Surge Proof ... High Voltage Distribution Transformers For Service on Rural Lines



Pioneered by Allis-Chalmers and backed by four years of satisfactory service

Specify Type "CB", Allis-Chalmers Transformers for continuous, trouble-free service. Here are 14 reasons why they are better:—

1—Completely surge-proof.

2—High voltage bushings coordinated, quadruple petticoat type, cover mounted.

3—Totally enclosed, sludge-proof tap changer; easily accessible through hand-hole in cover.

4—Bushing shanks and all internal electrical connections immersed in oil.

5—All leads encased in insulating tubing.

6—All terminals provided with non-corrodible solderless connectors.

7—Coordinated low voltage gang bushing.

8—All bushings easily demountable without removing cover.

9—Transformer of oil-tight construction and shipped completely filled with oil, ready for service.

10—Combination oil drain and sampling valve of non-corrodible material.

11—Hangers not extending below transformer base.

12—Skid angles underneath base.

13—End-turns super-insulated.

14—Taps brought out from the center of the windings insure safety against surges at this point.

Type CB Transformers, of which a 5 kva, 6900/11950Y—115/230 volt unit is illustrated, are available for 6900 volts and above. Type SB Transformers are available for the lower voltages.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

aged that system until 1917, when he went to the Pacific Power & Light Company. Subsequent connections included the Northwestern Electric Company and the Portland General Electric Company.

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T. H. Haines Undertakes Broader Responsibilities

Thomas H. Haines, superintendent of distribution of the Edison Electric Illuminating Company of Boston since 1925, had his jurisdiction enlarged on May 1 to include the installations de-

T. H. Haines

partment, which was merged with the first-named department on that date in connection with the retirement of Joseph W. Cowles after 40 years of service (ELECTRICAL WORLD, April 27, page 74). Mr. Haines was graduated from the Massachusetts Institute of Technology in mechanical engineering in 1911 and entered the company's service two years later as assistant head of the distribution department. He is widely known in the utility industry for his national committee activities and contributions to economic analysis in his special field. JOSIAH C. NORCROSS, veteran assistant to Mr. Cowles in the installations department, will serve as co-assistant with EDWARD C. RUE to Mr. Haines with the consolidation into one operating department.

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▶ MANFRED K. TOEPPEN, chief consulting engineer of the Michigan Public Utilities Commission, has resigned. Mr. Toeppen had been with the commission since 1920.

▶ K. B. MCEACHRON, research engineer of the General Electric Company at Pittsfield, Mass., whose studies in artificial lightning up to 10,000,000 volts have brought him world-wide recognition, will receive the Edward Longstreth medal of the Franklin Institute, Philadelphia, May 15. The award is based on his contribution of "Thyrite," a substance used in more than 35 different electric applications, principally for lightning arresters. In his thirteen years with the General Electric Company Mr. McEachron has dealt with the study of natural and artificial lightning. Many new methods of protecting distribution and transmission lines have been developed under his supervision, as were also the building of a portable cathode-ray oscillograph and the construction of the 10,000,000-volt lightning generator. In 1933 he was appointed engineer in charge of the high-voltage laboratory at Pittsfield, following the death of F. W. Peek, Jr.

▶ HARRY TROUTWINE, manager of the Boston branch of the Kelvinator Corporation, has been elected president of the Metropolitan Electrical League of Boston for the coming year.

▶ L. W. LYONS has been elected treasurer of the Westinghouse Electric & Manufacturing Company to succeed H. F. Baetz, retired. Mr. Lyons has been identified with Westinghouse since 1903.

▶ CARL O. HEDNER of the Yale & Towne Manufacturing Company, Philadelphia division, has been elected to the office of chairman of the Electric Hoist Manufacturers Association.

▶ MYRON A. COLER of New York has been awarded the seventh Weston Fellowship of $1,000 by the Electrochemical Society. Mr. Coler will carry out his research at Columbia University on electrophoresis. The fellowship was founded by Dr. Edward Weston, pioneer in electrochemistry.

▶ P. A. LASLEY, attorney of Little Rock, Ark., has been appointed chairman of the new state Utilities Commission by Gov. J. M. Futrell.

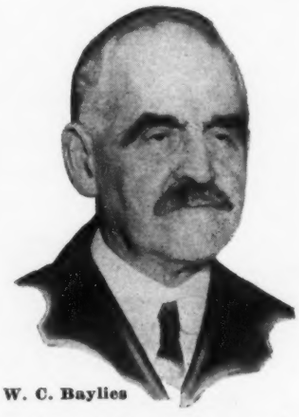
▶ HENRY ELLIS WARREN of the Warren Telechron Company, Ashland, Mass., has been made the recipient of the Wetherell medal by the Franklin Institute, Philadelphia, for his invention of the little motor which made possible the "Telechron" electrically regulated clock. Mr. Warren will also be presented with the Lamme Medal of the American Institute of Electrical Engineers at the summer convention next month.

▶ O. E. WELLER has been appointed chairman of the Maryland Public Service Commission to succeed Harold E. West, whose term of office expired May 6. Mr. Weller is a graduate of the United States Naval Academy, a lawyer and a business man, who for more than 25 years has been a leading factor in public affairs in Maryland. Mr. West was appointed to the commission in 1923, was made chairman the following year and has held that office continuously since that time. A newspaperman by profession, he quickly made himself an expert in the field of regulation. Under his chairmanship the Maryland Commission has taken high rank among the commissions of the country and some notable decisions have been made by it.

W. C. Baylies Retires

Walter C. Baylies, veteran official of the Edison Electric Illuminating Company of Boston and president of the company for the period from April, 1932, to February of the present year, has announced his retirement from active participation in the affairs of the company. Although disassociated with the management organization, Mr. Baylies will continue to serve the company as a member of the board of directors.

For many years Mr. Baylies has been an outstanding figure in Boston business



W. C. Baylies

circles through his banking, railroading and manufacturing connections. A native of Taunton, Mass., and a graduate of Harvard University, he first became associated with Boston Edison as vice-president in 1891, serving for three years, and was again elected to this office in 1900. His service as a director dates from 1891.

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▶ JOHN L. HALL, senior member of the law firm of Choate, Hall & Stewart of Boston, has been elected a director of the Westinghouse Electric & Manufacturing Company.

▶ J. L. ALEXANDER, manager of the central division of the Puget Sound Power & Light Company for the past four years, has resigned to become operating manager of the Twin City Rapid Transit Company in Minneapolis and St. Paul.

▶ FRANK A. KETCHAM, president of the Graybar Electric Company, was the guest of honor last week at a luncheon given by executives of the company to celebrate the completion of his thirty-fifth year of service with the company. A gold service button was pinned on Mr. Ketcham by A. L. Hallstrom, Atlantic district manager, in reciprocation for a similar service performed by Mr. Ketcham in January. On that occasion a luncheon was being given at Philadelphia for Mr. Hallstrom to commemorate his fortieth year of continuous service with the company. Mr. Ketcham became president in 1928.

OBITUARY

▶ R. J. Moore, for more than 20 years president of the Yamhill Electric Company, Newberg, Ore., died April 17, after an extended illness. Mr. Moore had worked for the predecessor of the Portland General Electric Company since about 1910. When the Portland company bought the Yamhill Electric Company Mr. Moore was made president of the subsidiary and had actively managed it from his headquarters in Newberg up to the time of his death.

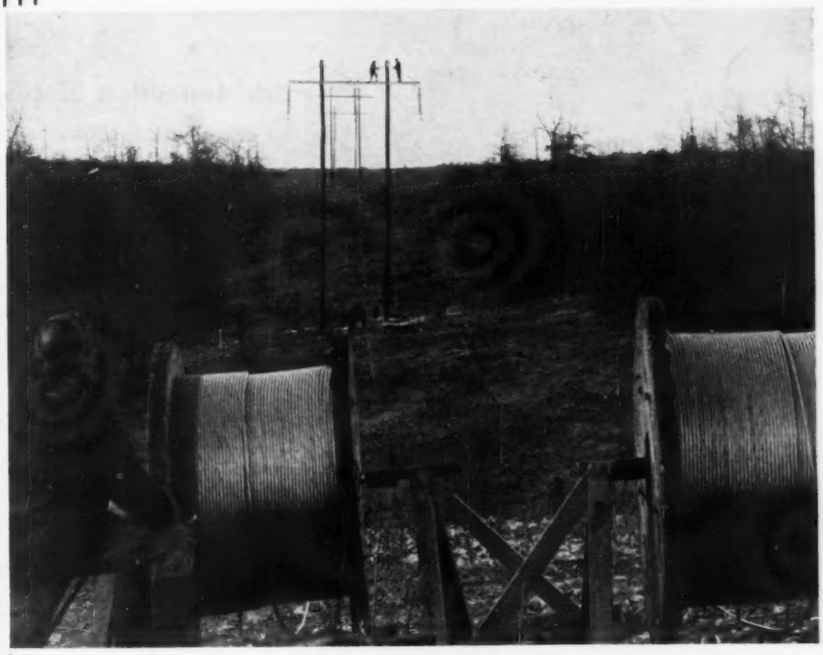
▶ Dr. Jay L. Arnold, professor emeritus of electrical engineering at the College of Engineering, New York University, died April 23 at his winter home in Orlando, Fla. He was 67 years of age. He had retired from his position at the university last June. Dr. Arnold was a fellow of the American Institute of Electrical Engineers, a member of the Society for the Promotion of Engineering Education and an honorary member of the American Electrotherapeutic Society.

▶ Warren B. Hadley, 75, a former associate of Thomas A. Edison and for eighteen years electrical engineer for the District of Columbia, died recently at his home in Washington. Mr. Hadley had done considerable experimentation as a youth on the arc lamp. He was an associate of the late Frank J. Sprague in laying down the Boston electric street car system and also did some pioneer work in the telephone field. While working with the old New York Edison Illuminating Company he was in charge of installing the first electric lights in Madison Square Garden. He transferred his interests to Washington about 35 years ago, relinquishing his active duties as electrical engineer for the district in 1931.

▶ Allen C. Cornell, associated with the Denver office of the Graybar Electric Company since 1917 and until recently its manager, died suddenly, of a heart attack, April 21. Mr. Cornell was well known in the electrical industry in the Rocky Mountain region. A native of Rochester, N. Y., he spent twelve years in St. Louis with the Western Electric Company before being transferred to Denver in 1917. In 1921 he was made manager in Denver and five years later, when the name of the business was changed to Graybar, he continued as manager and has occupied that position since that time. Recently, because of illness, he was granted a leave of absence in order that he might have an opportunity to regain his health. He was 52 years of age.

Modern Line Construction demands the high quality of

AmCreCo Poles



Why AmCreCo Poles Have Maximum Quality

1. Select southern yellow pine.
2. Incipient decay avoided.
3. Framing before treatment.
4. Preservative of known value.
5. Adequate single treatment.
6. Treatment accurately timed to proper seasoning.
7. Full length pressure treated.
8. Unequalled facilities and personnel of the leading producer.

Cheap poles cannot effect any important saving in the total cost of a distribution line, because labor cost is the same—regardless of the kind of poles. But once a line is built, then the economy of quality manifests itself. The present demand for lower operating costs dictates the selection of the highest quality material for this purpose.

AmCreCo poles contribute to lower operating costs from the day they are set in the line. The unsurpassed strength of AmCreCo poles does not deteriorate during the entire serviceable life of the pole. Renewals are held to a minimum as the full length pressure creosote treatment resists decay and insect damage, preserving the pole even to the next generation.

The low annual cost of AmCreCo poles testifies to the false economy of using inferior quality materials in modern line construction.

AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY INCORPORATED — AMCRECO — GEORGIA CREOSOTING COMPANY INCORPORATED

LOUISVILLE — KENTUCKY

NEW EQUIPMENT

Seep-Proof Bushings

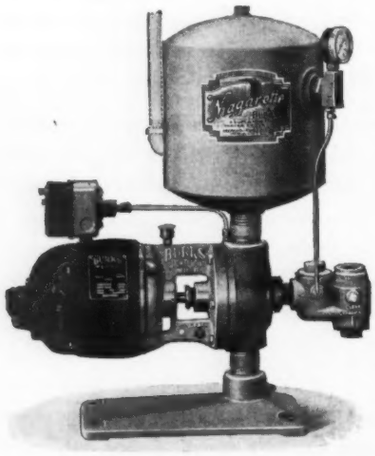
Ohio Brass

A new line of dry-type apparatus bushings for lower distribution voltages, which are both seep-proof and gas-tight, has been placed on the market by Ohio Brass Company, Mansfield, Ohio. Oil seepage has been definitely prevented in these bushings by a new method of assembly at the flange line and the use of a bronze insert at the top of the bushing which is ground to a true flat surface. A cork gasket between the lower porcelain weather shed and the metal mounting flange is held in constant compression and provides further protection against seepage.

•

Self-Priming Featured in Domestic Water System

A self-priming, electrically driven water-pumping system, designed to meet requirements in the domestic and industrial water supply fields, has been announced by the Decatur Pump Company, Decatur, Ill. The pump is supplied with a storage tank of 4-gal. capacity and an automatic air-volume control that maintains proper air-water ratio in the storage tank. Two sizes are available—$\frac{1}{6}$ hp., delivering 200 gal. per hour, and $\frac{1}{4}$ hp., delivering 300 gal. per hour, for either a.c. or d.c. operation. A suction lift of 28 ft. is claimed for this pump.



Decatur Pump

•

Convertible Induction Motors

A new line of convertible squirrel-cage and slip-ring induction motors having complete convertibility from open to fan-cooled, splash-proof or totally inclosed construction has been announced by the Harnischfeger Corporation, Milwaukee, Wis. Convertibility is accomplished through design of the frame, end heads and bearings to permit interchange in these four types of multi-speed, squirrel-cage and slip-ring motors.

Stator laminations are stacked between heavy steel end rings and the entire assembly is welded to the frame to provide rigidity and prevent the stator core from shaking loose. Rotor windings are assembled from round or rectangular copper bars which are placed in the rotor slots without insulation or slot wedges. Available in ratings from $\frac{1}{2}$ hp., 600 r.p.m. to 125 hp., 3,600 r.p.m.

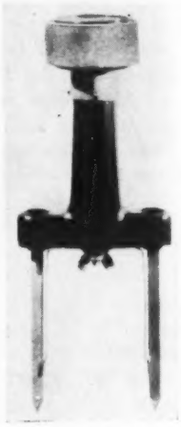
•

ANTI-VIBRATION "LITTELFUSES," made in high- and low-voltage types and designed for airships, aircraft radio transmitters, railway signal work, power supply circuits, etc., have been placed on the market by the Littelfuse Laboratories, Chicago. The low-voltage types ($1\frac{1}{4}$x$\frac{5}{32}$ in.) are intended for storage battery service, while the high-voltage types are designed for 1,000-, 2,500- and 3,000-volt service.

VAPORPROOF REFLECTOR GLOBE, No. 02368, for use where excessive dust and fumes make cleaning difficult, has been designed by the Holophane Company, Inc., New York. This new unit is smooth on both inside and outside surfaces so that maintenance is easy. The distribution curve has a wide maximum—between 40 and 55 deg.

A COMBINATION MOTOR AND COMPRESSOR, designed primarily for the spraying of paint, but which is easily adapted to any small device requiring a light, portable compressor, has been announced by the Dumore Company, Racine, Wis. The unit is equipped with a $\frac{1}{10}$-hp., air-cooled, universal type a.c. or d.c. motor, a compressor which is capable of delivering a dead-end pressure of 20 lb. and will deliver 650 ft. of air a minute through a $\frac{1}{4}$-in. discharge vent.

Battery-Cell Tester



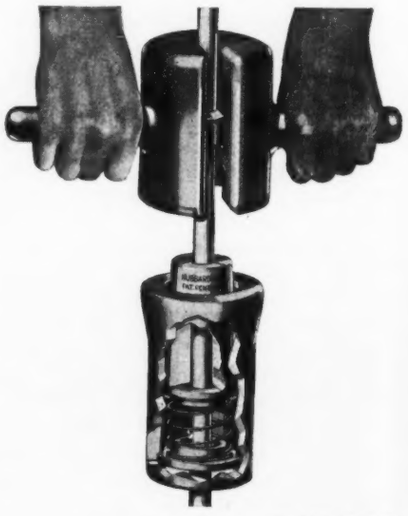
General Electric

A new Tungar battery-cell tester, featuring a special switch which permits the instrument to be used either for the usual high-rate-discharge tests or for open-circuit tests, has been placed on the market by the General Electric Company's Merchandise Department, Bridgeport, Conn. The special switch permits the instrument to be quickly converted to test the battery when it is either in or out of the car or on the charging line.

•

Ground-Rod Driver

Ground rods, 10 to 15 ft. in length, can now be driven at any distance from poles and structures, in solid undisturbed earth, by one operator who stands on the ground. A driver, consisting of a chuck and hammer, has been developed for this purpose by Hubbard & Company, Pittsburgh, Pa.



Hubbard & Co.

Since chuck and driver are symmetrical, a "square" blow is insured, which eliminates whipping the rod and minimizes bending. Long rods can be driven

Door stays closed →

Cartridge drops out
(INTO A TELL-TALE SIGNAL POSITION) →

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L-M PORCELAIN HOUSED DROP-OUT CUTOUT

It Speaks for itself---The simplicity of construction and the perfect operation of the PVD Drop Out are features well worth your interest. Available in 5000 volt and 7500/12500 volts grounded Y in 60 Ampere sizes. Write for details.

LINE MATERIAL CO

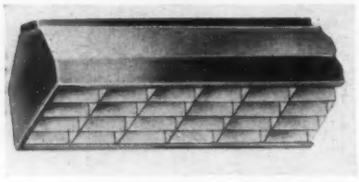
SOUTH MILWAUKEE, WISCONSIN, U. S. A.

with the chuck close to the ground, leaving a minimum length of unsupported rod between the chuck and ground. This further reduces chances of bending and permits driving long rods of small diameter. In driving ground rods into position below the surface of the earth the chuck forms a hole large enough for the clamp to be installed and tightened into place.

•

Low Cost and High Efficiency Featured in Lighting Fixture

Special, low cost, high efficiency, trough type, window lighting fixtures, utilizing Gar-Ray, a new type aluminum reflecting surface, have been announced by Garcy Reflectors, 1430 South Talman Ave., Chicago. These fixtures, tailored to the individual window, can be installed at lower cost than the equivalent closely spaced mirror units, it is claimed. Longitudinal, crosswise or double louver



Garcy Reflectors

screens, either hinged or stationary, are furnished with the reflectors. The new type reflecting surface used is flexible, practically indestructible, non-tarnishing and equals mirror efficiency.

•

Voltage Regulator Features Simplicity

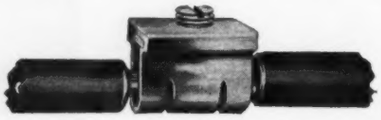
Simplicity and ease of operation and maintenance are featured in a new type vibrating contact, a.c., voltage regulator recently marketed by the Simplex Corporation of Burlington, Iowa. Construction is greatly simplified by the absence of dashpots or other damping devices and the avoidance of complicated circuits. The regulators are designed for operation with one or more generators, operating either separately or in parallel, and will accommodate generating units up to 5,000 kw. capacity.

•

A LOW-COST FIRE ALARM UNIT, for use with conventional electric alarm systems, has been announced by the G-M Laboratories, Inc., Chicago. Heat drops a tilted mercury-contact tube, closing an alarm circuit. Simplicity of operation and ease of installation make this device adaptable to use in home, stores, garages, factories and other buildings subject to fire hazard. The "Telafire" is normally adjusted to operate at about 135 deg. F.

Wire Connector

For service-entrance connections and all small wire joints the H. B. Sherman Manufacturing Company, Battle Creek, Mich., announces a "wedge-grip" con-



H. B. Sherman Mfg. Co.

nector of novel construction. The conductors are held by an "Everdur" screw against V-shaped corrugations in the copper body of the connector. The one connector size which is now available will hold two No. 14 wires and all larger sizes up to two No. 6. The device can be salvaged and used again, a special advantage in service connections, and is small enough not to appear bulky and unsightly when taped over.

•

Automatic Telephone for Private System

A new type private automatic interior telephone system of ten-line capacity has been placed on the market by the Automatic Electric Company, Chicago. The automatic switchboard used with this system includes a battery eliminator which can be plugged in any 110-volt, 60-cycle power supply, the switchboard and eliminator being mounted together as one unit.

Both wall and desk type telephones are available for use with this system. Each phone incorporates a standard ten-hole calling dial for setting up connections. Speedy, dependable connections and secret service are features of this system.

•

Disconnect Switches for Water Heaters

Square D

Disconnect switches used with two-element electric water heaters have been developed by the Switch and Panel Division, Square D Company, Detroit, Mich. The switch is front operated and consists of two 30-amp., two-pole, plug-fuse, individual switches in one inclosure.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

Construction, operation and control features of type-E, center-retort, underfeed stokers, are included in a 16-page catalog, No. E-8, published by Combustion Engineering Company, 200 Madison Avenue, New York. Diagrams of typical ashpit arrangements and applications of this stoker to various types of boilers are also given.

Mechanical features and applications of vertical four-cycle Worthington Diesel engines are in a recent bulletin of the Worthington Pump Company, Worthington Avenue, Harrison, N. J.

Construction features, suggested applications, specifications, connection diagrams and tables for air-cooled transformers are outlined in the 18-page bulletin GEA-897E of the General Electric Company.

Recommended standard sizes and dimensions of carbon brushes and brush shunts are given in "Proposed Revision of Simplified Practice Recommendations (R56-28) for Carbon Brushes and Brush Shunts," issued by the Bureau of Standards, Washington, D. C.

"Profit Through Paint," published by the Sherwin-Williams Company, 101 Prospect Avenue, N.W., Cleveland, Ohio, outlines the effect of proper use of paint in industry on light reflection, surface protection, personnel, heat reflection and sanitation. A graphic chart gives recommended paints for use in different industrial locations.

Light distribution curves, specifications and dimensions of table, desk and floor lamps are in a portfolio announced by the Light-Sight Corporation, New York City.

Bulletins 507, 510 and 514 of the Louis-Allis Company, Milwaukee, Wis., include construction and design features, assembly diagrams and pictures of the company's line of totally inclosed, fan-cooled, direct-current and single-phase motors.

A 52-page catalog describing a line of tanks, containers, mixers, chutes, hoppers, etc., and including assembly diagrams of typical applications of this industrial equipment has been announced by L. O. Koven & Brother, Inc., 154 Ogden Avenue, Jersey City, N. J.

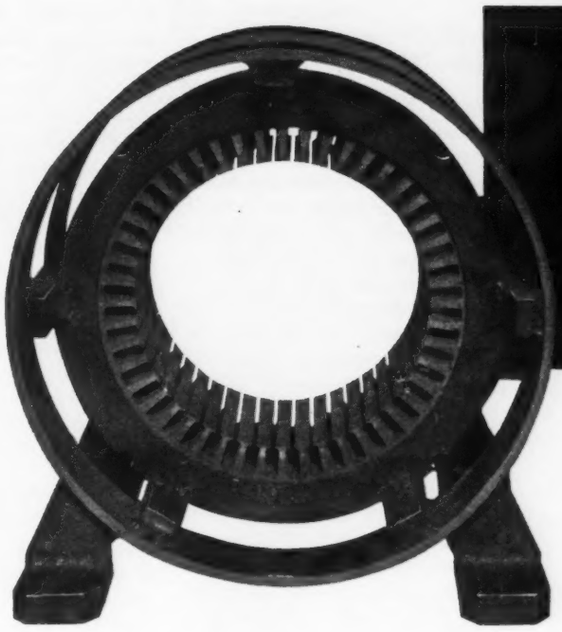
Wrought Washer Manufacturing Company, 2100 S. Bay Street, Milwaukee, Wis., has published a handbook listing 19,000 shapes, sizes and specifications of washers, stampings and miscellaneous assembly parts used in the design of electrical products.

Construction and design features, applications, specifications and general characteristics of electronic rectifiers have been included in a bulletin issued by the B-L Electric Manufacturing Company, St. Louis, Mo.

Information on the use of condensers in power-factor correction, motor starting and high-voltage circuits is given in catalog 127 of the Cornell-Dubilier Corporation, 4377 Bronx Boulevard, Bronx, N. Y.

A 54-page catalog (k-1), published by Baldwin-Duckworth Chain Corporation, Springfield, Mass., includes a 20-page section containing rules and formulas, charts and tables for the selection of chain drives.

UP-TO-DATE ELECTRICAL EQUIPMENT REQUIRES MODERN ELECTRICAL STEELS



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PERFECTED ELECTRICAL STEELS...SHEET AND STRIP

Licensed under patents 1,867,818; 1,932,306 to 1,932,309 inclusive; and other patents applied for.

Republic has kept pace with the advancement in mechanical design and construction of electrical equipment, and has developed improved electrical steels that make possible a new standard of performance—Sil-con.

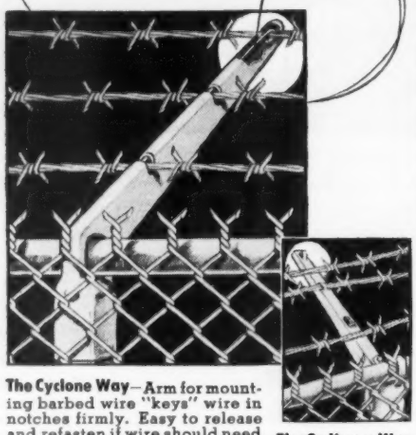
Sil-con Electrical Steels are available in both coiled strip and sheet. Unusual though it may seem, Sil-con Strip possesses electrical properties unsurpassed by the finest sheets available. Core loss is low—permeability high. Loose scale is absent. Temper is uniform. Coil set is removed and laminations lie flat—stack easily. Its use increases die life very materially and production is speeded up to a point where really worth while savings are apparent.

Tell us the equipment you make—there is a grade made specifically for every use. We shall be glad to send you, without obligation, performance curves on the grade of Sil-con Electrical Steel made for your products.

REPUBLIC STEEL

Republic Steel
CORPORATION
GENERAL OFFICES · · · YOUNGSTOWN, OHIO

why Cyclone extension arms give enduring service



The Cyclone Way—Arm for mounting barbed wire "keys" wire in notches firmly. Easy to release and refasten if wire should need adjusting. Construction provides great strength at top rail opening.

The Ordinary Way—The barbed wire is drawn through metal tongues which have to be hammered down (breaking galvanizing) to hold wire. Adjustments of wire cause tongues to break off. Strength is also lacking where extension arm accommodates top rail.

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This is but one of hundreds of fittings that protect owners of Cyclone Fence from high repair bills. Read about them in the new Cyclone booklet, "Fence—How to Choose It—How to Use It."

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LETTERS TO THE EDITOR

Why Not 10 Cycles For Boulder Power?

To the Editor of ELECTRICAL WORLD:

With the completion of Boulder Dam and the beginning of the filling of the lake behind it, which has recently been announced in the public press, the eyes of the engineering world are naturally focused on this unique power development. Descriptions of the electrical equipment which have appeared in the technical press indicate that the waterwheels and generators are designed to operate at either 150 r.p.m. for a 50-cycle frequency or at 180 r.p.m. for 60 cycles. The writer is informed that it is the present intention that both these frequencies are to be generated at Boulder Dam and that power at both 50 and 60 cycles is to be transmitted to the southern California district.

The writer wishes to take this occasion to question the wisdom of this choice of frequencies. The amount of power to be made available at Boulder Dam is, we are told, approximately 1,800,000 kw. The distance to Los Angeles is approximately 300 miles. The voltage that has been chosen for the transmission lines now building to Los Angeles is 287,000. Considerations of stability will place a very decided limit upon the amount of power that may be transmitted over a single 300-mile line at either 50 or 60 cycles. Since the cost of the transmission lines will be several times the cost of the electrical equipment at both ends, it would seem to be the part of wisdom to adopt a frequency for transmission such that the question of stability would not be the determining factor in the capacity of those transmission lines.

Ryan suggested 10 cycles

In this connection, may the writer call attention to a suggestion made some years ago by the late Prof. Harris J. Ryan of Stanford University? At one time Professor Ryan suggested the installation of a high-voltage busbar—so to speak—reaching the entire length of California and perhaps extending into Oregon and Washington. This busbar was to operate at a frequency of 10 cycles. Southern California, with its standard frequency of 50 cycles, could tie into this busbar with frequency changers of 5 to 1 ratio, while northern California, Oregon and Washington could tie in with frequency changers of 6 to 1 ratio. Thus power could be exchanged between any points on the Pacific Coast within reach of this busbar. This suggestion for the use of 10 cycles has a double advantage: First, it permits both 50- and 60-cycle systems to make use of it. Both these frequencies are standards in California. Second, it eliminates all questions of stability. Stability is almost entirely a matter that is determined by the reactance voltage in the transmission conductor, so that the stability limit of a transmission line is very nearly inversely proportional to frequency. Other conditions being the same, a 10-cycle line will carry about six times as much power as a 60-cycle or five times as much as a 50-cycle line so far as stability is concerned.

It would seem to the writer that the suggestion of Professor Ryan is particularly applicable to the problem of distributing Boulder Dam power. If it is later found—as the writer confidently predicts will be found—that the Arizona, Nevada and southern California markets are unable to absorb the 1,800,000 kw. to be made available at Boulder Dam, there will be an excess of power available with no market within reach where it may be used.

Aside from the questions of stability and economics, there are serious questions of operation that will arise with either 50 or 60 cycles as soon as the distance of transmission becomes anything of the order that might be used to serve parts of California other than Los Angeles and vicinity. When such a line is excited from one end and is open at the other a rise in voltage occurs at the open end that may become serious. Also, the generator capacity to handle such a line at the higher frequencies without having the generator become self-excited from capacity effect, and therefore uncontrollable as to voltage, becomes a difficult question. These operating problems are very serious at either 50 or 60 cycles and line lengths exceeding 300 miles. Higher voltage for transmission is not an answer since these operating problems are accentuated thereby so long as 50 or 60 cycles is adhered to. At 10 cycles these problems virtually disappear.

Other projects should study frequency

This question of choice of frequency for transmission is by no means confined to Boulder Dam. The United States government is definitely committed to the development of power at two sites in the Columbia River basin. The writer understands that the amount of power to be made available on the Columbia River is even more than at Boulder Dam. Here again the conditions are in many respects similar to those at Boulder Dam. The power will be developed in the midst of a desert region hundreds of miles from any existing market. Transmission to that market is essential. It is questionable whether this transmission can be economically accomplished at 60 cycles—the standard frequency for this region. Also, it would seem highly desirable if the Columbia River developments could be

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Self Aligning—Resulting in Accurate Readings
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Simply place the instrument around the conductor and you know accurately the load on the transformer, motor, feeder, etc.; no loss of time.

(b) **Your personal safety and convenience:**
Above all, the Ferranti Clip-On Ammeter is SAFE. The core is supported on a bakelite frame which is mounted on solid bakelite handles. To minimize the chance of short circuiting adjacent conductors the core is covered with a layer of bakelite.

Each instrument is *tested* for 17,000 volts.

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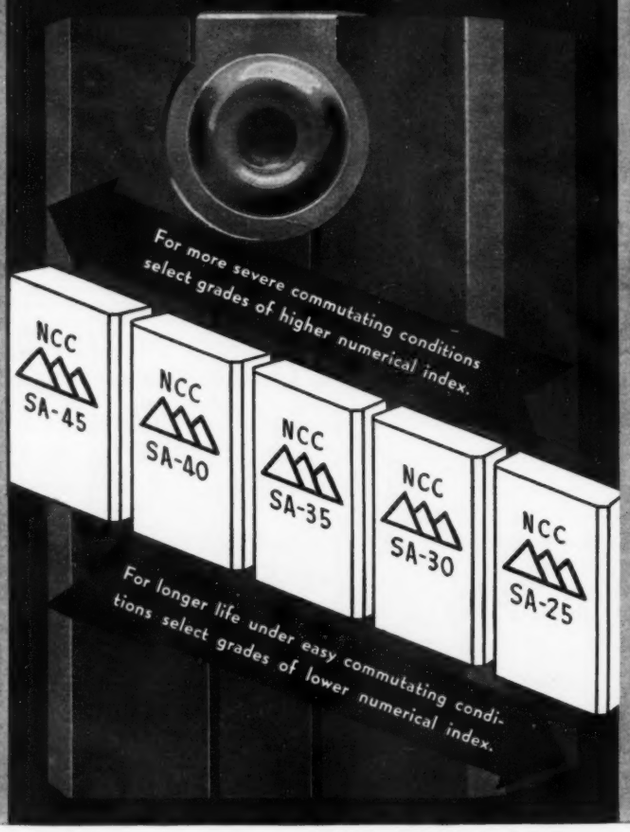
For more severe commutating conditions select grades of higher numerical index.
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For longer life under easy commutating conditions select grades of lower numerical index.

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tied in with Boulder Dam—something utterly impossible if 60 cycles is used, but quite feasible with 10. The proposed St. Lawrence power development is another case in point. Here again the amount of power to be made available and its distance from existing markets makes a 60-cycle frequency for transmission questionable from an economic standpoint. At 10 cycles it might become feasible from an economic standpoint.

In short, the amounts of power and the distances of transmission that are immediately before us in the case of Boulder Dam and only a few years away in the case of the Columbia River developments, and perhaps also the proposed St. Lawrence development, make it highly desirable to make a study of the situation and determine whether or not the time has come to establish a new standard frequency for transmission. If any dream of a continent-wide network for power distribution is ever to come true, it certainly cannot be accomplished at the existing standard frequency of the United States—60 cycles. Now is the time for a careful study to see if Professor Ryan's suggestion for 10 cycles is not one to be adopted.

PAUL M. LINCOLN,
Director School of Electrical Engineering, Cornell University.

BOOK REVIEWS

The Three Little Meters and the Telephone Become Dam Conscious

By A. J. Wager and R. A. Aschenbrener. Published by the Triple Insulaire Company, 161 W. Wisconsin Avenue, Milwaukee, Wis. 40 pages. Price, 25 cents.

The meters, gas, water and electricity, break into print again with their friend, the telephone, this time to prove that although water power may be free where and as it occurs, it costs money to transform it into electricity and deliver it to the place of use. Mr. Kilowatt, who reports for work so promptly when a button is pushed, must be housed and fed. A peculiar thing about him is that if you save money on his food you have to spend more on his housing. If you give him fuel to eat, he'll be happy to live in a low-cost power plant. But if you expect him to be nourished only on water you'll have to spend a whole lot more to house him. The greater cost of a home for the water-fed Mr. Kilowatt, plus the fact that this home must be built away off in the wilds and thus Mr. Kilowatt has a long way to travel to get to his work, makes it cheaper in the usual case to feed him on fuel so he will be content to dwell in a lower cost house closer to his work.

The politician who pours out public funds for water-power development, declaiming as he turns the spigot about our "great natural resources," and the befooled citizen who applauds him should go

with Wattso, the electricity meter, to visit Santa Claus in his winter home near the North Pole. The politician finds here the fact, millions of tons of it, to justify him in talking about "cheap and abundant ice for every home and farm," while his faithful stooge again listens and agrees.

•

Lighting Calculations

By H. H. Higbie. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York, N. Y. 503 pages, illustrated. Price, $5.

Illumination is apparently moving out of the empirical, tabular-data era into more precise calculation in design of effective luminaires and effective illumination generally. Professor Higbie has here presented the most complete graphical and mathematical approach to design procedure involving flux, sources (point, line and surface), brightness, multiple reflection, utilization coefficients, light generation and visual effectiveness.

The book is profusely illustrated by problems based on wide illumination literature. In a separate mailing tube come four large charts for protractor analysis of surface and line sources. This book is a timely contribution to the new specification trend inspired by the growing acceptance of light as a tool for right seeing. It makes one critical of loose statements so often found in lighting literature and demonstrates that lighting is a practically calculable art.

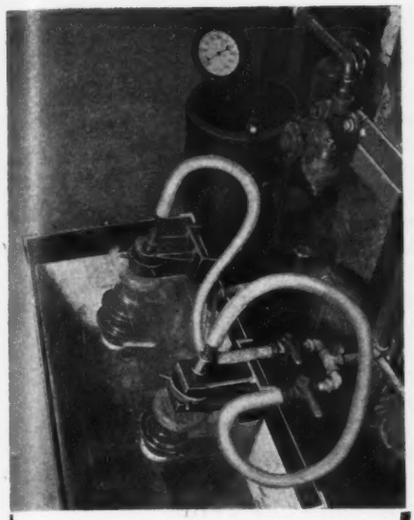
•

Marketing Industrial Equipment

By Bernard Lester. Published by the McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 296 pages, illustrated. Price, $3.50.

Lectures in a graduate course in industrial equipment marketing at University of Pittsburgh by the assistant sales manager of the industrial department of the Westinghouse Electric & Manufacturing Company form the basis of this book. It has none of the high-pressure sales technique of so many books on marketing of consumer goods. Dealing exclusively with capital goods, it looks at productive industry to get the perspective, then takes up, chapter by chapter, the methods of analyzing the product, the call for it and the competition, the channels available for distribution to the market and the cost entailed. The functioning of the sales organization at headquarters and in the field are followed by methods of checking the customers' standing, habits and needs and how his specifications are framed.

The author has been so placed that he was familiar with the technique and experience of many industrial firms. One of the most significant features of the book is the large number of actual cases (some name names) cited to bear out the points made in the text. A goodly number of these citations are chosen from the electrical marketing field.



MOISTURE

can't get in

The greatest cause of arrester mortality is moisture.

So, every LV arrester is tested under water. Air at a pressure of 25 pounds per square inch is applied to the inside of the arrester. Tell-tale bubbles of air mean rejection.

In addition LV arresters are given periodic "Weather-Cycle" tests at temperatures corresponding to the hottest summer days and the coldest winter weather; under conditions simulating rain, snow and ice. Six times this test is repeated—yet, to date, not a single arrester has shown the slightest trace of moisture.

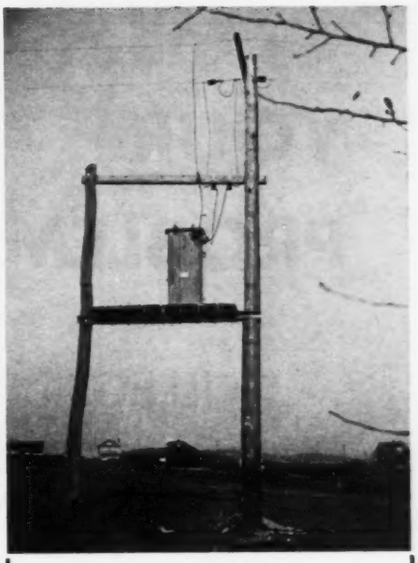
Why not get a copy of Catalog 38, which describes the new LV Arresters, from Westinghouse, Room 2-N, East Pittsburgh, Pa.

R 54006

Westinghouse

New

LV ARRESTERS



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RURAL LINE VOLTAGE

drops!

Now, you can economically maintain a reasonably normal voltage on rural distribution lines. The new Westinghouse BR Booster provides a boost of 5% or 10%, during the heavy load periods when voltage falls below normal.

Easily and quickly installed . . . requiring only a small initial investment . . . and needing practically no attention or maintenance . . . this automatically-controlled booster will pay for itself in a surprisingly short time through increased revenue from existing loads and stimulated use of load-building equipment.

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Get complete information today from Westinghouse Electric, Room 2-N, East Pittsburgh, Pa.

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The New

BR BOOSTER

YOUR
PROBLEMS

• ILLEGAL DIVERSION
• METER INSTALLATION
• METER TESTING

SUPERIOR
REG. U. S. PAT. OFF.

+(BAIS-20)

CAN HELP
YOU

The
SUPERIOR SWITCHBOARD
AND DEVICES COMPANY
CANTON, OHIO

+Been At It Since 1920

Sangamo Electric to Make Compensating Meters

Exclusive license has been secured by the Sangamo Electric Company under the Schleicher U. S. Patent Nos. 1,957,232 and 1,957,233 to manufacture compensating meters for metering primary energy on the low-tension side of power transformers. For polyphase circuits these units will comprise a three-element meter together with the necessary calibrated resistances suitable for use with existing transformer installations. In order to promote the widest possible use of this metering equipment, licenses have also been extended to other meter manufacturing companies.

•

Line Material Profit

For the year 1934 the Line Material Company and subsidiaries report net income, after expenses, interest and other deductions, of $99,791, equal to 47 cents a share on 213,207 capital shares, compared with net loss of $43,430 in 1933.

•

Battery Meeting Postponed

Announcement has been made that the spring convention of the National Battery Manufacturers Association, Inc., originally scheduled for May 22 and 23 at the Hollenden Hotel, Cleveland, Ohio, has been postponed. As soon as definite dates have been decided another announcement will be made.

•

Anaconda Reports Gains

For the quarter ended March 31 Anaconda Wire & Cable Company and subsidiaries report net profit, after expenses, depreciation, obsolescence, provision for federal taxes and other charges, of $216,266, equal to 51 cents a share on 422,470 capital shares outstanding, against $126,304, or 30 cents a share, in the similar quarter of last year.

•

More Oil Burner Shipments

Shipments within the United States of domestic oil burners using mechanical draft were 76,812 units in 1934, 68,569 units in 1933. September, with 13,818 units and October, with 14,568 units, were the peak months of 1934. The low month was February, 1,876 units. January shipments were 3,089 units in 1935, 2,112 in 1934 and 1,697 in 1933.

Total shipments of all kinds, including burners using natural draft and those for other than domestic use and including exports, were 106,882 in 1934 and 90,754 in 1933.

The data are announced by the Bureau of the Census for 160 identical manufacturers comprising about 88 per cent of the industry.

Kelvinator Executive Predicts Record Business

Further evidence of the record being established by the electric refrigeration industry this year was seen in the financial report of Kelvinator Corporation for the first half of that company's fiscal year. The report showed that for the first time in the last five years operations during this customarily quiet half resulted in a net profit of $66,975, comparing with a loss of $36,419 for the first half of the 1934 fiscal year. H. W. Burritt, vice-president in charge of sales, in discussing the report, pointed out that while this profit reflects an unusually early beginning of the spring sales season, present reports from distributors and dealers indicate that volume is continuing to increase and that the heaviest months—April, May and June—should send the industry's volume to a point which will virtually assure a new record.

•

General Electric Organizes Home Builders Service

In line with the increased interest in home construction and modernization, and in order to render a service to architects and home builders which will insure proper installation and arrangement of electrical servants, leading to maximum convenience and satisfaction for home owners, a Service for Architects, Consulting Engineers, and Home Builders has been organized as a part of the General Electric Institute at Nela Park, Cleveland, under the supervision of C. M. Snyder.

•

Okonite Cuts Losses

Net loss of the Okonite Company for the year 1934, after depreciation, interest, provision for income tax and other deductions, amounted to $63,183, compared with $157,741 in 1933.

•

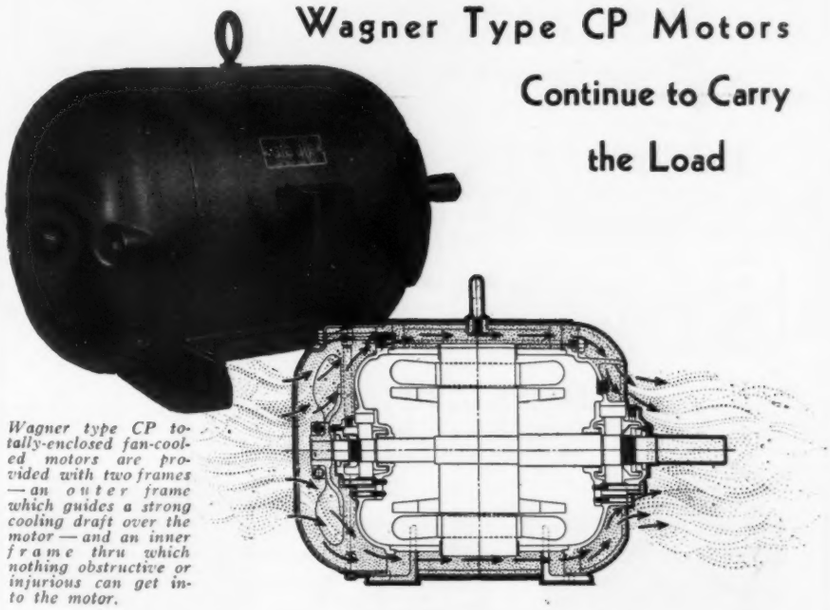
Electric Ranges in Demand

In a report to the stockholders of Electromaster, Inc., Detroit, manufacturers of "Waldorf" electric ranges and water heaters, R. B. Marshall, president, announces a 52 per cent increase in the sales of the company during the first quarter of 1935, in comparison with the same period a year ago. March showed the greatest monthly increase for the year so far.

Edison General Electric Appliance Company, Inc., announced that the demand for "Hotpoint" ranges has increased to such an extent that "we are unable to obtain sufficient quantities of the two-heat tumbler switches for both the RA19 and RA20 models. Therefore, the RA19 range will for the present be equipped with rotary type switches."

WHEN EXPOSED to DUST, FUMES, MOISTURE

Wagner Type CP Motors Continue to Carry the Load



Wagner type CP totally-enclosed fan-cooled motors are provided with two frames — an outer frame which guides a strong cooling draft over the motor — and an inner frame thru which nothing obstructive or injurious can get into the motor.

Year in and year out, under all types of atmospheric conditions, Wagner totally-enclosed fan-cooled type CP motors continue to carry the load.

The ordinary open-type motors are all right in their place, but when motors are to be exposed to destructive elements which will short-circuit and corrode them, Wagner totally-enclosed fan-cooled type CP motors should be used.

Wagner type CP motors are ideal for atmospheres laden with dust, fumes, and moisture, because:

1. All vital motor parts are completely sealed against dust, fumes, and moisture which would short-circuit or corrode the motor.
2. No maintenance is required other than periodic greasing.
3. No special housing need be erected to protect the motor.
4. All tests have proved Wagner type CP motors are safe and dependable—no shutdowns to clean out motor, and consequent production losses.

If you are troubled with dust, fumes, and moisture problems, either thruout your plant or in isolated departments, an investigation of Wagner type CP motors will undoubtedly solve your difficulties. Write for a copy of Part 5B of Wagner Bulletin 174.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, U.S.A.

MOTORS TRANSFORMERS FANS BRAKES

L235-1

There are 2 distinct types of "MEGGER" Instruments

1—for Insulation Testing
and measurements of conductor resistance.

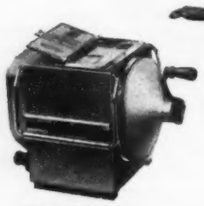
2—for Ground Testing
(resistance to earth of ground connections).

THE engineer or electrician who has at least one each of these TWO TYPES of our "Megger" instruments is well equipped to protect himself and his company against failure of equipment and service interruptions due to all ordinary cases of weakened or defective insulation, and due to all cases of high ground resistance.

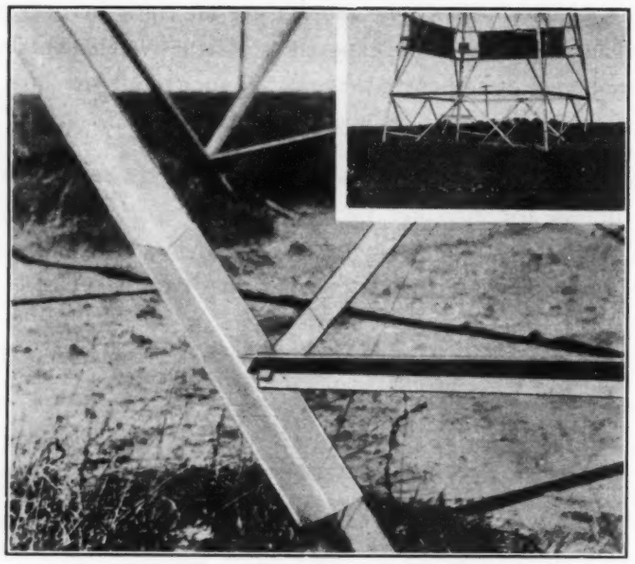
Write for new *Catalog 1400-W* describing the various types of the "Megger" Insulation Testing Instruments, and for new *Catalog 1425-W* (now in preparation) describing the "Megger" and "Meg" Ground Testers.

JAMES G. BIDDLE CO.
ELECTRICAL INSTRUMENTS
1211-13 ARCH STREET PHILADELPHIA, PA.

"MEGGER" Testing Set


"MEG" Type

"MEGGER" Ground Tester



Field Test Proves Practicality of Painting Without Removing Rust

The above tower (in the Alliance-Canton Circuit of Ohio Public Service Co.) was spot coated with aluminum pigmented Rust-tox in August, 1932. The rust was rather heavy, but it was not removed.

This photograph, taken 26 months later, shows (1) no breaking through of the rust; (2) a perfect film of protection; and (3) high brilliancy of the aluminum powder.

Rust-tox is an approved vehicle for aluminum powder and paste. Samples and complete data will be sent upon request.

RUSTOX

THE SKYBRYTE COMPANY, Cleveland Ohio
West Coast Distributors: H. E. Townsend, 913 Carrillo Drive, Los Angeles
Mountain State Distributors: The Gallagher Co., Salt Lake City, Utah

Recent Rate Changes

Public Service Electric & Gas Company has been ordered to cut its electric rates $5,176,566 a year by the New Jersey Board of Public Utility Commissioners. The decision provides that at least 65 per cent of the reduction, or $3,364,768, must be applied to the domestic consumer class. This is expected to reduce the bill of the average residential consumer approximately 13 per cent. The commission's announcement stated that the $5,176,566 reduction ordered "is predicated upon a fair value and rate base taken for the purpose of this proceeding at $322,625,405 and an allowance as a fair rate of return of 6¾ per cent."

•

Seattle City Council unanimously passed an ordinance reducing the basic domestic rate for Seattle City light customers from 5½ to 5 cents a kilowatt-hour for the first 40 kw.-hr., effective May 16. The reduction will give householders an average saving of 20 cents per month, or a saving to City Light users of $160,000 a year. J. D. Ross, superintendent, stated he will ask for another cut of an equal amount within three to six months.

•

Nebraska Supreme Court has taken jurisdiction of an appeal by the Iowa-Nebraska Light & Power Company from action of the State Railway Commission in holding that it has control of rural electric rates. The commission admits that it has no constitutional authority for fixing such rates, but claims that proper construction of several laws passed at different legislative sessions bestows such power upon it.

•

Kentucky-West Virginia Utilities Company, following a three months' controversy with consumers, has reduced its electric rates 25 per cent. An appeal to the State Public Service Commission was dropped.

•

New York State Electric & Gas Corporation's electric rates to residential, commercial and power consumers in the Otsego division have been reduced approximately $147,000 annually. The state Public Service Commission has approved the new schedule.

•

Indiana General Service Corporation's new rate schedules for rural and suburban communities in nine northeastern counties (ELECTRICAL WORLD, February 2, page 82) have been approved by the State Public Service Commission. The order results in a reduction of approximately 5 per cent to customers.

•

Columbus Railway, Power & Light Company has been authorized by the Ohio Public Utilities Commission to decrease its rates to commercial consumers

in seven communities surrounding Columbus. Under the new schedule commercial consumers will be charged 2 cents per kilowatt-hour for all energy used over 20,000 kw.-hr. Under the old schedule it was necessary for them to use 100,000 kw.-hr. before this rate could be given.

•

Citizens Heat, Light & Power Company has been ordered by the Indiana Public Service Commission to reduce electric rates in nine cities and towns. The reductions average 10 per cent.

•

Missouri Power & Light Company has reduced its electric rates in 88 cities and towns in central and north Missouri. The rates have been approved by the State Public Service Commission and will save consumers $20,913 or more annually.

•

New York State Electric & Gas Corporation has filed revision in its electric rates which will reduce charges to consumers in the Otsego division of the company's territory and the changes have been approved by the Public Service Commission. Customers will save approximately $17,700 annually.

•

Central Hudson Gas & Electric Corporation's electric rate revisions, reducing charges under the commercial rate for demands over 5 kw., have been approved by the New York Public Service Commission. The change, effective May 1, was estimated to give an annual reduction of $43,000 to customers.

•

British Output Increases

Official returns to the British Electricity Commission show that 1,507,000,000 units of electricity were generated in March by authorized undertakers in the United Kingdom, compared with the revised figure of 1,391,000,000 units in the corresponding month of 1934, representing an increase of 8.3 per cent. During the first three months of 1935 the total amount of electricity generated by authorized undertakers was 4,699,000,000 units, compared with the revised figure of 4,270,000,000 units for the corresponding period of 1934, representing an increase of 429,000 units, or 10 per cent.

•

Promotional Fund Raised

Announcement has been made by the Electrical Industry Business Development headquarters in Denver that a $50,000 budget has been assigned to promotional work during the remaining months of 1935. Half of the budget is underwritten by the Rocky Mountain Electrical Association and the Electrical League of Colorado and the other 50 per cent by the Public Service Company of Colorado.

NRA CODE

6 reasons why Exide Ironclads cut handling costs

1. Exide-Ironclad Batteries provide sustained voltage — keep materials moving at good speeds.
2. High power ability — unusual performance with heavy loads or on steep grades.
3. Dependability — Exide-Ironclads cut service interruptions to a minimum.
4. Electrical efficiency — Exide-Ironclads are economical at the charging panel.
5. Low cost of maintenance — a minimum of attention keeps Exide-Ironclads on the job.
6. Long life — the unique Exide-Ironclad positive plate construction, and the new Exide Mipor Separators are two of the reasons why Exide-Ironclads last so long, perform so well and cost so little in the end.

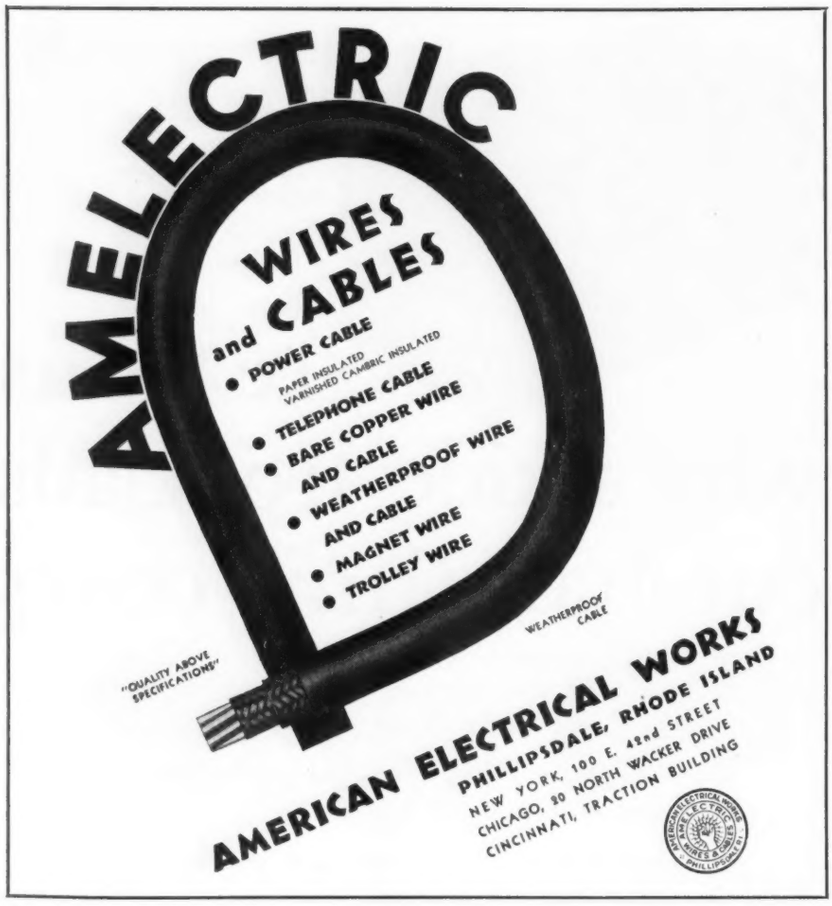
Improve the operation of your electric industrial trucks or electric switching locomotives by installing Exide-Ironclad Batteries. Write for booklet "Facts for Consideration in Selecting a Storage Battery."

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Exide
IRONCLAD
BATTERIES

WITH EXIDE MIPOR SEPARATORS

"MIPOR," Reg. U. S. Pat. Off.



New
HI-TEST "MAL"
SCREW ANCHOR

The Most Efficient Screw Anchor Ever Made

1. Greater strength
2. More area
3. Easier to install
4. Lighter weight
5. Rust resisting
6. No wrench required

The extra strength of the hi-test malleable iron used in the construction of this anchor makes possible its thin blades and small hub. Both features give it light weight, more pulling area, and sharper blades, which mean easier installation, easier handling, and better results.

The tapering blades give a maximum thickness at the greatest bending moment and a minimum thickness at the greatest friction point. The wide pitch of the helix and the flange point reduces friction and makes installation easier and quicker.

The galvanized steel rod with the large drop-forged thimbleye is locked to the anchor at the factory. It cannot come loose or turn on the rod. Anchors can be screwed out intact. The thimbleye has a 1⅜" eye opening to permit the use of a rod, up to that size, as a wrench.

Write for information.

A·B·CHANCE CO.
Utilities Division

FACTORY & GENERAL OFFICES, CENTRALIA, MO.

SALES OPPORTUNITIES IN NEW CONSTRUCTION

CEDAR CITY, UTAH—Southern Utah Power Company plans new transmission line in Iron Mountain district, about 12 miles.

KNOXVILLE, TENN.—Director of Purchases, Tennessee Valley Authority, asks bids until May 21 for fabricating, galvanizing and delivering 37 double-circuit steel transmission towers and accessories for Wilson Dam-Picking Landing Dam transmission line. Also, until May 27 for fabricating and delivering gate hoists and hoisting mechanisms for radial gates and trashway gates for Wheeler Dam power project.

RELAY, MD.—Joseph E. Seagram & Sons, Inc., New York, distiller, operating Calvert-Maryland Distilling Company, Inc., Relay, Baltimore, plans new plant at latter place, equipped for initial capacity of 125,000 bbl. per annum. A power house will be built. Cost about $1,000,000 with equipment.

COLUMBUS, NEB.—Loup River Public Power District, Columbus, C. B. Fricke, president, asks bids until May 24 for two new power houses for hydro-electric power project, one to be situated near Columbus, estimated to cost about $500,000, and other near Monroe, Neb., to cost approximately $300,000. Fund of $7,300,000 has been secured through federal aid for entire program. Harza Engineering Company, 20 North Wacker Drive, Chicago, Ill., is consulting engineer.

SAN ANGELO, TEX.—Has called special election on May 14 to vote bonds for $900,000 for new city-owned electric light and power plant and electrical distribution system. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

CHICAGO, ILL. — Walgreen Company plans installation of motors and controls, conveyors, electric hoists and other equipment in new multi-story drug and chemical plant unit. Cost about $250,000.

CANAL POINT, FLA.—Florida Power & Light Company, Miami, plans early construction of new power transmission line from Canal Point to Port Mayaca, for service at latter place.

POST FIELD, OKLA. — Construction Quartermaster, United States Army, Fort Sill, Okla., asks bids until May 22 for installation of night lighting system at Post Field (Circular 31).

BERKELEY, CALIF. — American Forge Company, San Francisco, Calif., plans installation of motors and controls, conveyors, electric hoists, etc., in new plant at Berkeley. Cost close to $100,000. K. Thiell, 580 Market Street, San Francisco, is consulting engineer.

LODI, CALIF.—Has secured fund of $600,000 from P.W.A. for new hydro-electric power plant on Mokelumne River, about 27 miles from city, and will proceed with project soon. Installation will include 1,375-kva. generator unit, reaction type waterwheels and complete accessories. Project will include transformer station at power plant, 27-mile transmission system to municipality, power distribution substation at latter place and electrical distributing lines. F. C. Herman, Merchants Exchange Building, and Walter L. Huber, Crocker First National Bank Building, both San Francisco, Calif., are consulting engineers.

LEESVILLE, OHIO—United States Engineer Office, Zanesville, Ohio, asks bids until May 24 for new dam at Leesville, in-

cluding lighting and power system, conduits for electric wiring, crane, trolley and chain hoist, gates and operating mechanism, and accessories (Circular 95).

MUSCATINE, IOWA—Plans construction of transmission line for power service. Application for permission has been made.

AVON, CALIF.—Associated Oil Company, San Francisco, Calif., plans installation of motors and controls, conveyors, electric pumping machinery, etc., in new additions to oil refinery at Avon. Cost about $125,000.

LIBERTY, TEX.—Soon takes bids for equipment for city-owned electric light and power plant, including Diesel engine-generators and auxiliary apparatus. Also for complete electrical distribution system, with poles, cables and wires, transformers, service facilities, etc. Fund of $95,200 has been approved by PWA. Garrett Engineering Company, 300 Hughes Street, Dallas, Tex., is consulting engineer.

OMAHA, NEB.—Cudahy Packing Company, Chicago, Ill., meat packer, plans installation of motors and controls, conveyors, electric hoists and other equipment in new additions to edible oil refining plant at Omaha. Cost about $150,000.

TREMPEALEAU, WIS.—United States Engineer Office, St. Paul, Minn., asks bids until May 17 for power, control and lighting system for Lock and Dam No. 6, Mississippi River, near Trempealeau, including transformers and regulators, switchboard and instruments, incoming line transformer installation and connections, remote control switch cabinets, incoming power line, limit switches, dam conduit system, dam power feeders and connections, transformer installation for dam, etc. (Circular 152).

SYLVANIA, OHIO—Is arranging financing for $150,000 for proposed city-owned electric light and power plant. Work scheduled to begin soon. George Champe & Associates, Nicholas Building, Toledo, Ohio, are consulting engineers.

WELLSVILLE, OHIO — Sterling China Company plans installation of motors and controls, conveyors, etc., in new addition to pottery, for which bids will be asked soon on general contract. Cost about $160,000.

PITTSBURGH, PA.—United States Engineer Office, Pittsburgh, asks bids until May 15 for two butterfly valves for Tygart River Dam, W. Va.; also until May 27 for two 48-in. needle valves, same project (Circulars 358 and 357, respectively).

AUGUSTA, GA.—Swift & Company, Chicago, Ill., meat packer, plans installation of motors and controls, conveyors, electric hoists, etc., in new multi-story branch plant at Augusta. Cost close to $100,000.

HAVERHILL, MASS.—Lennox & Briggs Leather Company, Haverhill, plans installation of motors and controls, conveyors, etc., in connection with proposed rebuilding of tannery, recently destroyed by fire. Loss about $100,000.

PANAMA CITY, FLA.—Plans installation of motors and controls, electric hoists, conveyors, crane, loaders and other equipment for proposed new municipal dock, warehouse and cotton compress plant. Appropriation of $550,000 is being secured through federal aid.

PORTLAND, ORE.—United States Engineer Office, Portland, asks bids until May 24 for two 43,200 kw., a.c., electric generating units, with complete auxiliaries and spare parts (Circular 603).

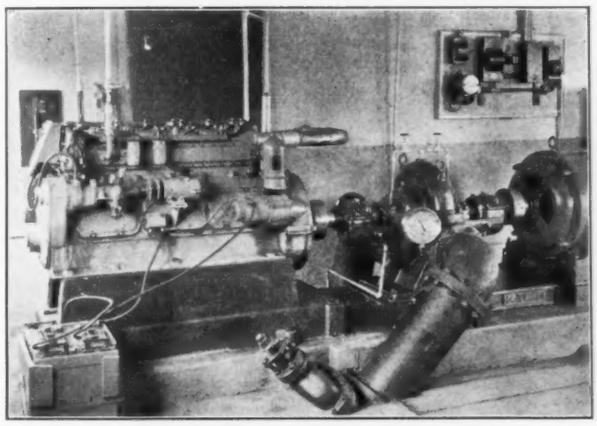
TRAIL, B. C.—Consolidated Mining & Smelting Company of Canada, Ltd., Montreal, Que., plans installation of transformers and accessories, heavy-duty motors and controls, conveyors, regulators, electric hoists and other equipment in new multi-unit sulphuric acid plant at Trail. Cost about $2,000,000.

THE COMPREHENSIVE CATALOG

offered by Sterling completely covers the application of engines for emergency pumping and generator drives. Even the details of installation are described. Many years of effort and a great perponderance of these engines in such work are back of this book. Select a Sterling, follow the instructions and be assured of a successful unit.

Sterling High Duty Internal Combustion Engines

12 to 565 B.H.P.
Gas or gasoline



As a standby in emergency the Falls View Pumping Station, Niagara Falls, Ont., employs a Sterling Petrel 6-cyl., 125 H.P. engine direct connected to a DeLaval centrifugal pump. The pump has a capacity of 2½ million Imp. G.P.M. against 60 lbs. pressure, speed 1500 R.P.M.

STERLING ENGINE COMPANY

1270 Niagara St.
Buffalo, N. Y.

Dept. C-2

900 Chrysler Bldg.
New York, N. Y.

SYSTEM OPERATORS and DISPATCHERS *thoroughly trained* in 6 months

UNDER EVERY KNOWN OPERATING AND EMERGENCY CONDITION.

DISPATCHERS' INSTITUTE offers young, ambitious men in the utility field an opportunity to qualify for key jobs in the operating department through intensive yet practical and fully approved new methods of training.

It provides utility executives with a recognized and dependable source of supply for alert, quick-thinking men, familiar, through actual operation, with every type of modern dispatching office layout and system, under both normal and emergency conditions.

During the six months Institute course, students spend 75% of their time in dispatchers' offices which duplicate exactly current utility practice. Every operating condition can be accurately simulated in each of these offices from a central control room. Every two weeks the student is switched to a different office having an entirely different system and layout. Thus it is actually possible to give a student, in six months, practical experience equivalent to what he could expect only after several years in the average utility operating department.

Dispatchers Institute graduates are fully qualified to take charge with little or no additional training. Utility executives will find that the Institute course can safely be used to eliminate costly and time-consuming training methods in their own operating department. Students will find the course a long sought means to promotion and broader opportunity. Write for prospectus.

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Service
Definitions
Symbols
Weather Forecasting
System Diagrams
Loads
Records
General System Operating Rules
System Operation
Generating Stations
Transmission Lines
Sub-Stations
System Telephone Lines
Troubles
Anchor Ice
Maintenance
Live Line Maintenance
System Power Factor
Water Supply Forecasting
Load Forecasting

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DISPATCHERS INSTITUTE

ONEONTA, N. Y.

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AIR-CONDITIONING EQUIPMENT
Frigidaire Corp., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Kelvinator Corp., Detroit, Mich.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.
ALLOYS, NICKEL
International Nickel Co., New York, N. Y.
AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti, Inc., New York, N. Y.
ANALYSES, REVENUE
Recording & Statistical Corp., New York, N. Y.
ANCHORS, GUY
Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa.
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.
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Graybar Electric Co., New York, N. Y.
BATTERIES, STORAGE, ALL APPLICATIONS
Electric Storage Battery Co., Phila., Pa.
Gould Storage Battery Co., Depew, N. Y.
USL Battery Corp., Niagara Falls, N. Y.
BATTERIES, STORAGE, AUTOMOTIVE
Firestone Tire & Rubber Co., Akron, Ohio.
USL Battery Corp., Niagara Falls, N. Y.
BATTERY CHARGING APPARATUS
General Electric Co., Schenectady, N. Y.
BLOCKS, LINEMEN'S CABLE STRINGING
Western Block Co., Lockport, N. Y.
BLOCKS, METER TEST
States Company, Hartford, Conn.
BOILERS, STEAM
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.
BOXES, FUSE
G & W Elec. Specialty Co., Chicago, Ill.
General Electric Co., Bridgeport, Conn.
BRACES & STRAIN INSULATORS, WOOD
Hubbard & Co., Pittsburgh, Pa.
BRACKETS & WIREHOLDERS, INSULATED
Hubbard & Co., Pittsburgh, Pa.
BRUSHES, CARBON
National Carbon Co., Cleveland, Ohio.
BURNERS, OIL, GAS, PULVERIZED FUEL
Babcock & Wilcox Co., New York, N. Y.
Combustion Engineering Co., New York, N. Y.
BUS BAR SUPPORTS
Burndy Engineering Co., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Pacific Elec. Mfg. Corp., San Francisco, Cal.
Schweitzer & Conrad, Inc., Chicago, Ill.
BUS BARS & TUBES
American Brass Co., Waterbury, Conn.
CABLE, ALUMINUM
Aluminum Co. of America, Pittsburgh, Pa.
General Cable Corp., New York, N. Y.
CABLE, NETWORK
Anaconda Wire & Cable Co., New York, N. Y
American Steel & Wire Co., Chicago, Ill.
Rockbestos Products Corp., New Haven, Conn.
CABLE, PAPER INSULATED
American Elec'l Works, Phillipsdale, R. I.
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite-Callender Cable Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York
Roebling's Sons Co., J. A., Trenton, N. J.
CABLE, PARKWAY
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
Okonite Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.
CABLE, STEEL STRAND
American Steel & Wire Co., Chicago, Ill.
Indiana Steel & Wire Co., Muncie, Ind.
Roebling's Sons Co., J. A., Trenton, N. J.
CABLE, SUBMARINE
American Steel & Wire Co., Chicago, Ill.
Anaconda Wire & Cable Co., New York, N. Y.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Okonite Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.
CABLE, VARNISHED CAMBRIC
American Steel & Wire Co., Chicago, Ill.
American Elec'l Works, Phillipsdale, R. I.
Anaconda Wire & Cable Co., New York, N. Y.
Crescent Ins. Wire & Cable Co., Trenton, N. J.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Kerite Ins. Wire & Cable Co., New York, N. Y.
Okonite Co., Passaic, N. J.
Phelps-Dodge Copper Products Co., New York
Roebling's Sons Co., J. A., Trenton, N. J.
Simplex Wire & Cable Co., Boston, Mass.
CABLE ACCESSORIES
Anaconda Wire & Cable Co., New York, N. Y.
G & W Elec. Specialty Co., Chicago, Ill.
General Cable Corp., New York, N. Y.
General Electric Co., Schenectady, N. Y.
Line Material Co., South Milwaukee, Wis.
Metropolitan Device Corp., Brooklyn, N. Y.
CABLE END BELLS
G & W Elec. Specialty Co., Chicago, Ill.
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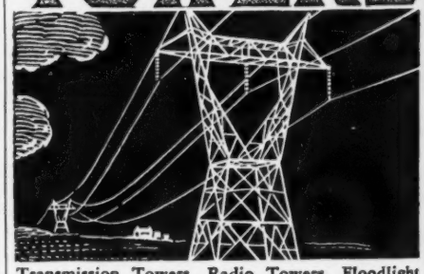

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